# BEVERLY AND KAMINURIAK CARIBOU

# MONITORING AND LAND USE CONTROLS

# 1990

Northwest Territories Resources, Wildlife & Economic Development

103-05923/

# BEVERLY AND KAMINURIAK CARIBOU
# MONITORING AND LAND USE CONTROLS
# 1990

LINE GAUTHIER

AND

ROBERT MULDERS

DEPARTMENT OF RENEWABLE RESOURCES

GOVERNMENT OF THE NORTHWEST TERRITORIES

RANKIN INLET, NWT

1990

Northwest Territories Renewable Resources

File Report No. 102

# ABSTRACT

The timing and pattern of Beverly and Kaminuriak caribou movements, in relation to the Caribou Protection Areas, were monitored between 15 May and 15 July, 1990 by the G.N.W.T. (Renewable Resources). Information on cow/calf movements was provided to Indian and Northern Affairs Canada (I.N.A.C.), who in turn enforce the Caribou Protection Measures.

Eleven monitoring flights were conducted over the Beverly (2) and Kaminuriak (9) Caribou Protection Areas for a total of 41 flying hours. Thirteen Land Use Permits were issued within and adjacent to the Protection Areas. No releases were requested during the monitoring period. One company, Inco Gold, located in the Dawson Inlet Area, was active for a period of 4 days within the Kaminuriak Protection Area in mid-May. Only 2 other companies (Urangesellschaft N90C313, C314, and Asamera Minerals N89J266), located nearby the Protection Areas, were active during the monitoring period.

Tracks indicated that Beverly caribou reached their calving ground through the northwest corner of the Protection Area via the Thelon Game Sanctuary. The Beverly caribou calved over an area of 2,055 $km^2$ located between the Upper Garry River and an unnamed lake ($65^{o}35'N$ X $100^{o}05'W$) to the east. By 10 June, approximately 50% of females had calves. By late June, most of the Beverly cows and calves had left the Protection Area at the southwest corner and were scattered in the Thelon Game Sanctuary. This report recommends that the eastern section (2,160 $km^2$) of the Beverly Protection Area be removed since caribou have not used this area during the past 5 years.

Kaminuriak caribou approached their calving ground, located south of Banks Lake between Derby and Duffy lakes, from Kaminak Lake and the north end of Maguse Lake. On 10 June, 65% of cows had calved over a calving ground encompassing 3,390 $km^2$. By mid-June, cows and calves had started moving towards the Hudson Bay coast. By late June, caribou had left the calving area and were scattered south of Happotiyik Lake and near Maze Lake. While one portion of the herd had shifted inland to Kaminak Lake by 5 July, other concentrations were still dispersed along the coast in mid-July. This report recommends that a 430 $km^2$ area west of Pistol Bay be added to the Kaminuriak Protection Area. As well, one area to the northeast (880 $km^2$) and one to the northwest (440 $km^2$) could be removed from the Protection Area.

TABLE OF CONTENTS

ABSTRACT . . . . . iii

LIST OF FIGURES. . . . . vii

LIST OF TABLES . . . . . ix

INTRODUCTION . . . . . 1

METHODS . . . . . 4

RESULTS AND DISCUSSION . . . . . 15
Beverly Caribou . . . . . 15
Spring Migration . . . . . 15
Calving Grounds . . . . . 16
Post-Calving Movements . . . . . 19
Kaminuriak Caribou . . . . . 21
Spring Migration . . . . . 21
Calving Grounds . . . . . 24
Post-Calving Movements . . . . . 25

LAND USE ACTIVITY . . . . . 35
Caribou and Active Land Use Sites . . . . . 35
Within Caribou Protection Areas . . . . . 35
Adjacent to Caribou Protection Areas . . . . . 39
Caribou and Inactive Land Use Sites . . . . . 40
Kaminuriak Caribou Protection Area . . . . . 40
Adjacent to Caribou Protection Areas . . . . . 41

WATER CROSSINGS . . . . . 43

RECOMMENDATIONS . . . . . 44
Protection Area Boundaries . . . . . 44
Beverly Caribou Protection Area . . . . . 45
Kaminuriak Caribou Protection Area . . . . . 45
Air Charter . . . . . 49

ACKNOWLEDGEMENTS . . . . . 51

PERSONAL COMMUNICATIONS . . . . . 52

LITERATURE CITED . . . . . 53

APPENDIX A. 1990 Caribou Protection Measures . . . . . 55

APPENDIX B. Standard 1990 Caribou Monitoring Flight Report. 57

APPENDIX C. Other Mammal Species Observed on 1990 Monitoring Flights . . . . . 58

LIST OF FIGURES

Figure 1. 1990 Caribou Protection Areas within the Keewatin Region . . . . . 3

Figure 2. Caribou monitoring flight lines over the Beverly Caribou Protection Area, June, 1990 . . . . 6

Figure 3. Caribou monitoring flight lines over the Kaminuriak Caribou Protection Area between mid-May and mid-June, 1990. . . . . 7

Figure 4. Caribou monitoring flight lines over the Kaminuriak Caribou Protection Area between mid- and late June, 1990 . . . . . 8

Figure 5. Caribou monitoring flight lines over the Kaminuriak Caribou Protection Area between early and mid-July, 1990 . . . . . 9

Figure 6. 1990 Beverly herd pre-calving migration routes and calving area . . . . . 17

Figure 7. Beverly caribou concentrations and post-calving movements in late June, 1990 . . . . . 20

Figure 8. 1990 Kaminuriak herd pre-calving migration routes and calving area . . . . . 23

Figure 9. Kaminuriak caribou concentrations and post-calving movements between mid and late June, 1990 . . . . . 28

Figure 10. Kaminuriak caribou concentrations and post-calving movements between early and mid-July, 1990 . . . . . 30

Figure 11. Mineral exploration sites within and in the vicinity of Caribou Protection Areas, Keewatin Region, 1990 . . . . . 38

Figure 12. Recommended boundary changes for the Beverly Caribou Protection Area in 1990 . . . . . 46

Figure 13. Recommended boundary changes for the Kaminuriak Caribou Protection Area in 1990 . . . . . 48

# LIST OF TABLES

Table 1. Schedule and rationale for 1990 caribou monitoring flights. . . . . 11

Table 2. Caribou sighted per monitoring flight between 15 June and 15 July, 1990 over the Kaminuriak Caribou Protection Area. . . . . 27

Table 3. Mineral exploration sites within or near the Caribou Protection Areas, Keewatin, 1990. . . . 36

# INTRODUCTION

During the 1970s, Baker Lake residents were concerned that mineral exploration activities might be affecting traditional caribou (Rangifer tarandus groenlandicus) range use by altering patterns of migration. Indian and Northern Affairs Canada (I.N.A.C.) introduced its Caribou Protection Measures in 1978 which imposed controls on land use operations within specific zones defined as Caribou Protection Areas (primary calving and post-calving areas), and called for a caribou monitoring program (Darby 1978). In order to mitigate potentially harmful human activity on calving caribou, the 1978 Protection Measures set limitations on land use operations between 15 May and 31 July. After 1982, the monitoring period was reduced by two weeks, ending on July 15. Depending on the presence or absence of caribou in the vicinity of land use sites, permits can be granted within the Caribou Protection Areas during calving and post-calving periods. Since the initial implementation of the Caribou Protection Measures, Protection Area boundaries have been changed regularly, to reflect shifting patterns of caribou distribution.

In conjunction with I.N.A.C., the Government of the Northwest Territories (G.N.W.T.), Department of Renewable Resources, as stipulated in the Caribou Monitoring Agreement, conducted the 1990 Caribou Monitoring Program between 15 May and 15 July over the Beverly and Kaminuriak Caribou Protection Areas in the Keewatin Region (Fig. 1). The main objectives were to:

1) provide I.N.A.C. with information on cow/calf distribution in the vicinity of specific land use sites (release applicants) in order to facilitate the enforcement of the Caribou Protection Measures, and

2) document calving ground distribution and post-calving movements, as spelled out in the Caribou Monitoring Agreement.

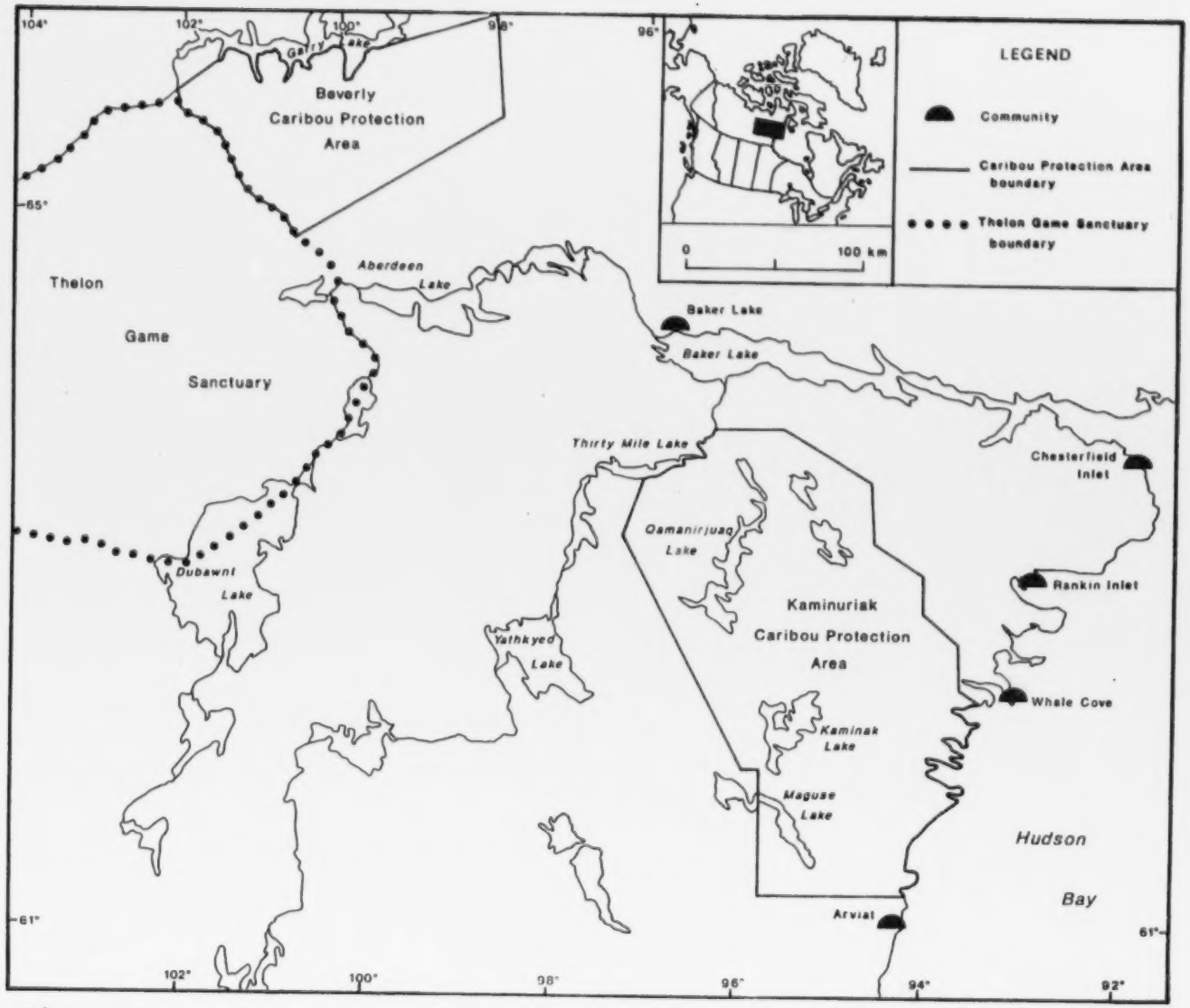


Figure 1. 1990 Caribou Protection Areas within the Keewatin Region.

## METHODS

We conducted monitoring flights in and adjacent to the Beverly and Kaminuriak Caribou Protection Areas between 16 May and 13 July 1990. Additional observations from G.N.W.T. Renewable Resource Officers, biologists, hunters, local people, and I.N.A.C. personnel were recorded until the end of July.

Prior to 26 June, monitoring flights were conducted in a twin engine SWIIA (Merlin) aircraft, whereas a BE-58 (Beech Baron) was used for the remainder of the monitoring period. On 24 June, the Monitor accompanied I.N.A.C. on a land use site inspection flight conducted in a Bell 206B helicopter. Pilots flew visually on every monitoring flight since none of the aircraft were equipped with an electronic navigational aid, such as "Omega".

A flight plan was prepared before each departure and the I.N.A.C. District Manager informed of the flight rationale. First priority for monitoring flights was given to address any release request. When no such requests were made, guided by the Caribou Monitoring Agreement, general monitoring flights were conducted in order to acquire information on caribou abundance, movements, and distribution in both Protection Areas during the pre-calving, calving and post-calving periods. Flight lines were based on recent observations and reports of cow/calf movements, and historical patterns of caribou distribution, as well as active and inactive land use sites within or near Protection Areas. These

general monitoring fights included the delimitation of Beverly and Kaminuriak calving areas.

Flight altitude varied from 180 meters to 300 meters above ground level (AGL), the lowest being reached in bad weather conditions or for specific monitoring needs such as determining cow/calf ratios. A lower cruising speed of 185 km/h was maintained within the Protection Areas, and increased to 245 km/h over adjacent areas.

Forty-one hours of flying time were used during the monitoring period. In all, 11 flights plus 1 flight with I.N.A.C. (1.3 hours) were conducted over both Caribou Protection Areas (Fig. 2, 3, 4, and 5). Because of aircraft technical problems, flying time was limited to 3 hours (7%) during the pre-calving period, and 12.1 hours (30%) during the calving period for both Caribou Protection Areas. More than half (63%) of the flying time was used for the post-calving period.

During each monitoring flight, at least, one observer (HTA representative, Regional Biologist, Renewable Resource Officer, Wildlife Technician etc.) accompanied the Monitor. On average, a 3 km wide strip was scanned (with binoculars) on either side of the aircraft and the following information recorded:

a) visual estimates of numbers of caribou over 1 year of age,

b) sex and age composition (cows, calves, yearlings, bulls) when possible,

c) direction of movement, and

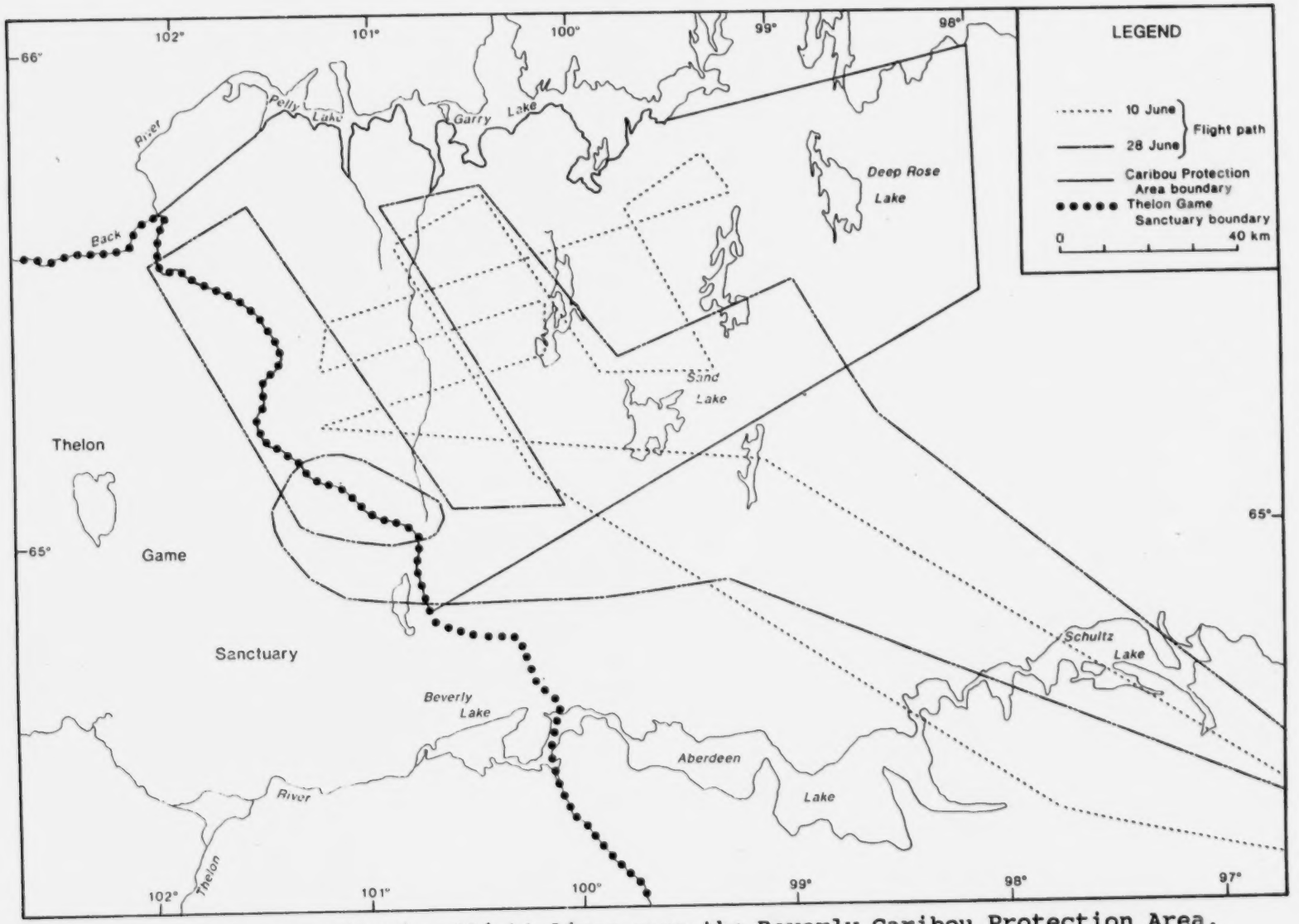


Figure 2. Caribou monitoring flight lines over the Beverly Caribou Protection Area, June 1990.

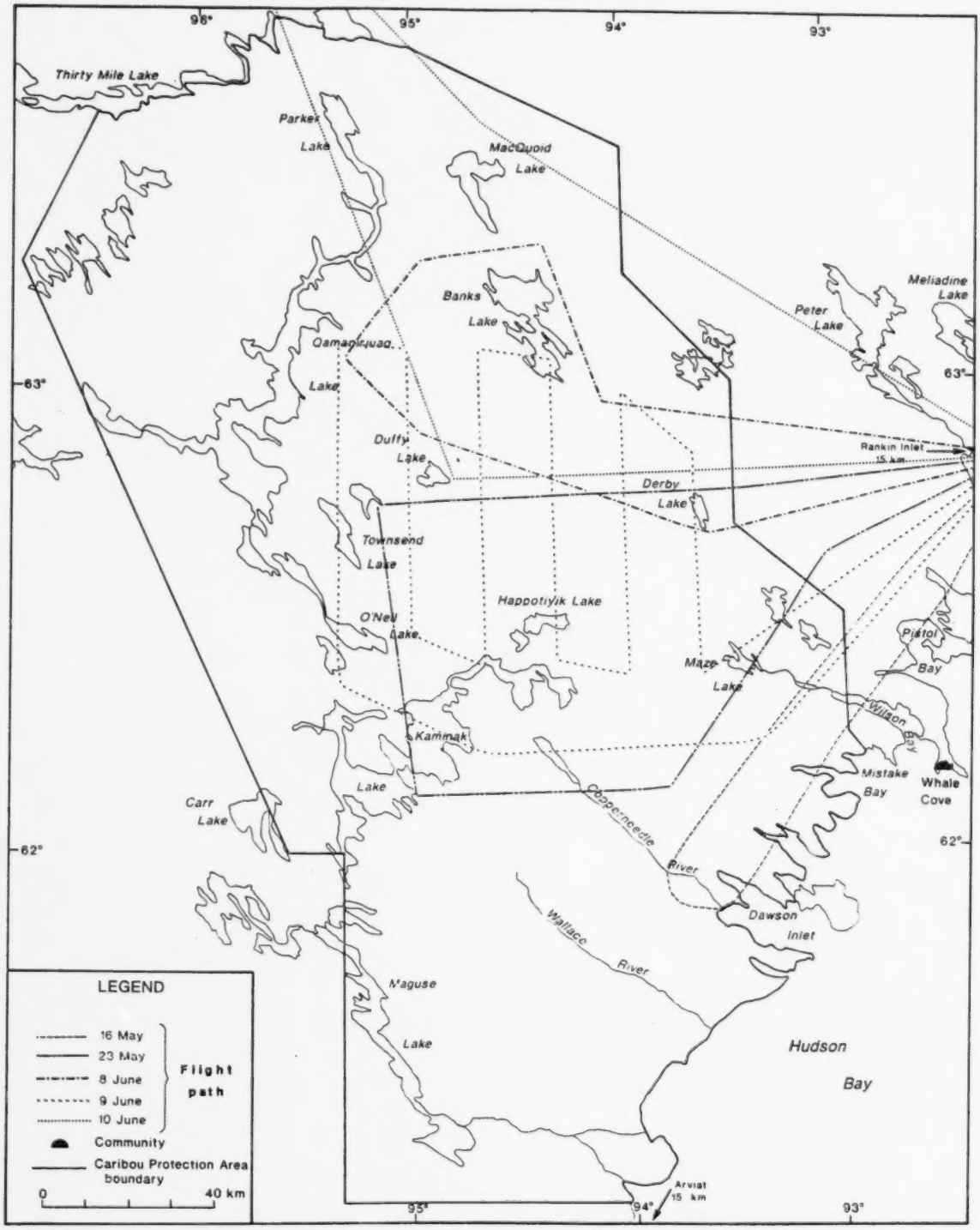


Figure 3. Caribou monitoring flight lines over the Kaminuriak Caribou Protection Area between mid-May and mid-June, 1990.

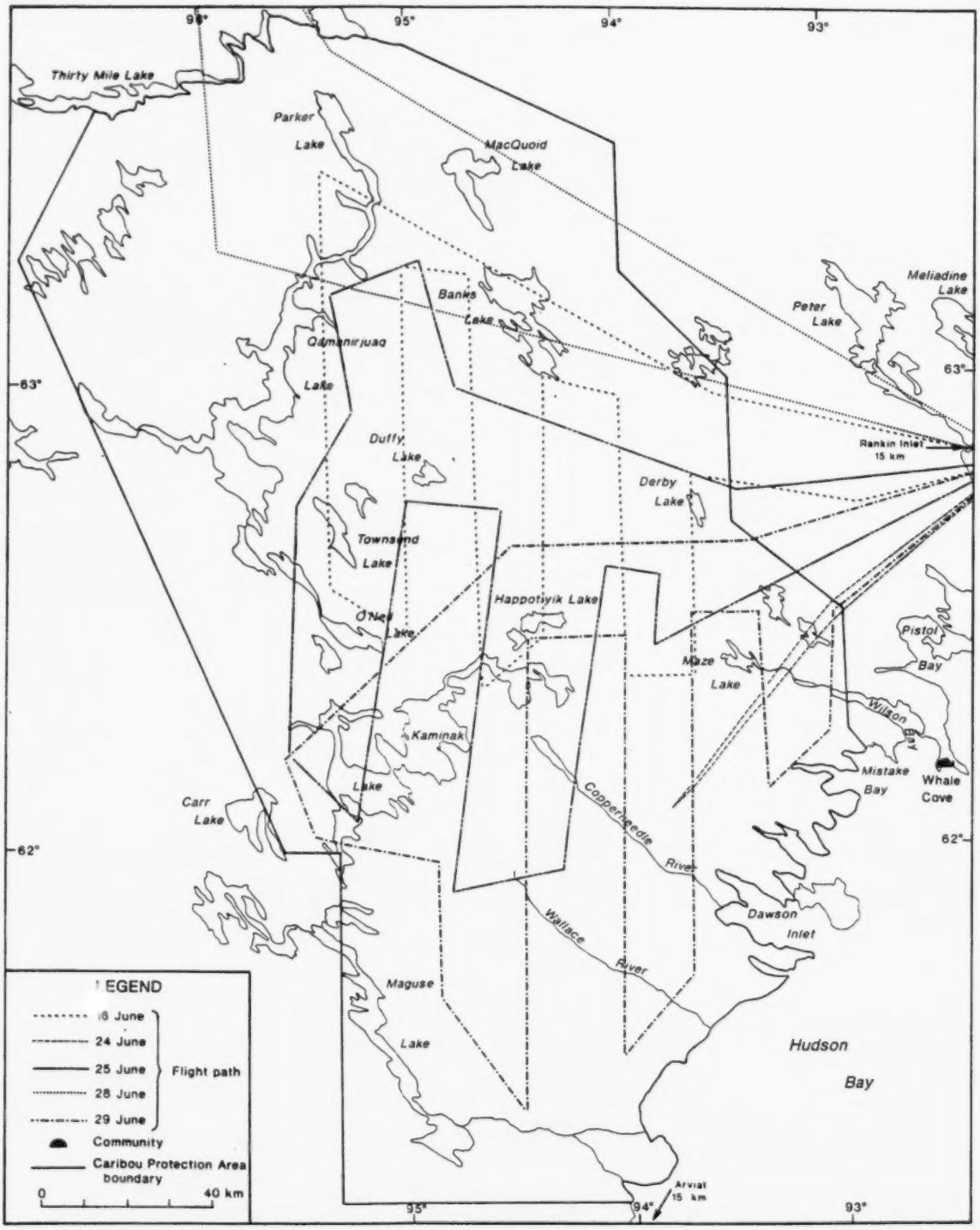


Figure 4. Caribou monitoring flight lines over the Kaminuriak Caribou Protection Area between mid- and late June, 1990.

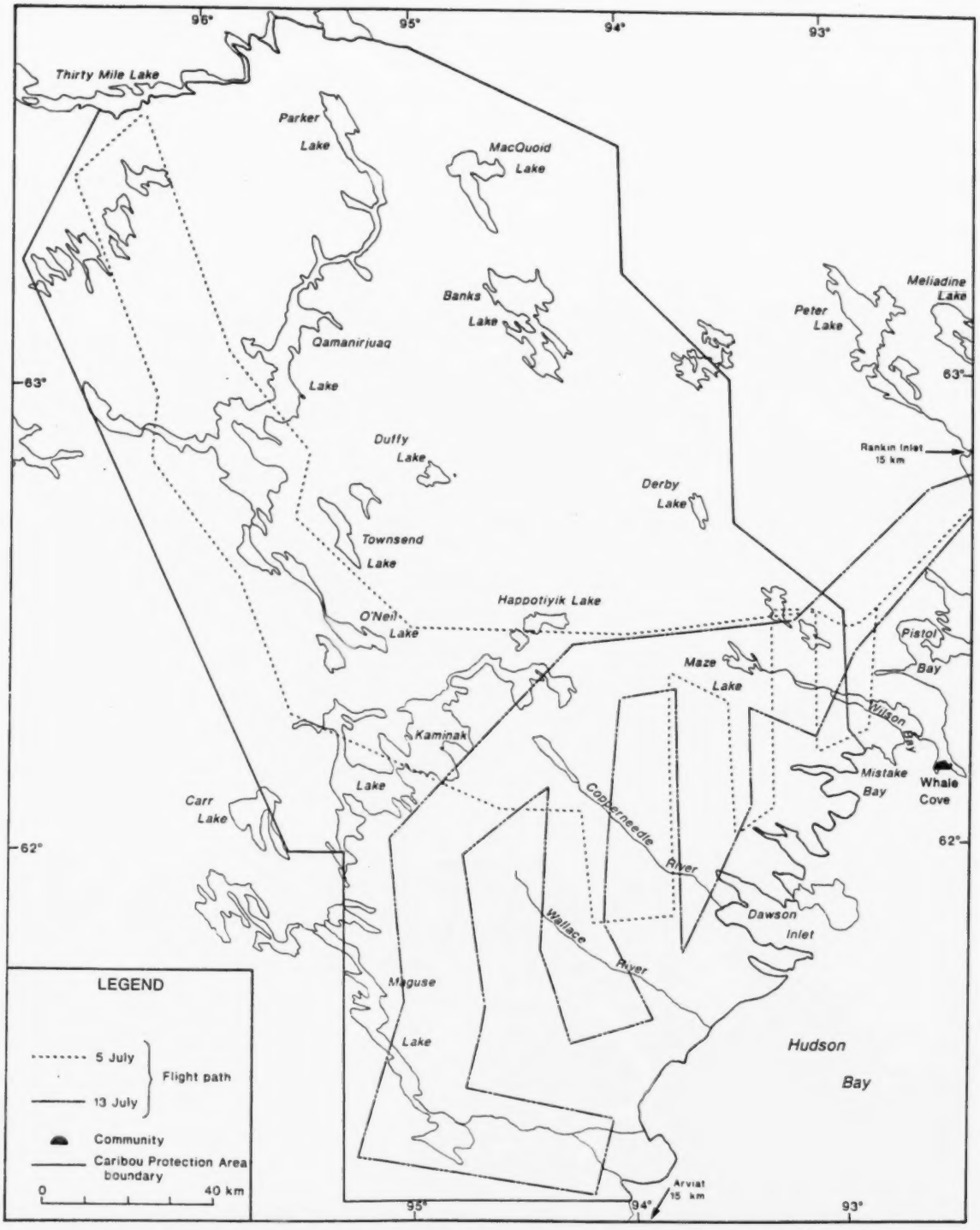


Figure 5. Caribou monitoring flight lines over the Kaminuriak Caribou Protection Area between early and mid-July, 1990.

d) presence of caribou trails, their orientation, and an estimate of the number of animals passing through rated as light (<50), moderate (50-100), and heavy (>100).

A telemetry tracking system was used on one occasion in June to help to locate major post-calving aggregations during a low level monitoring flight (300 m AGL).

The number of flights over the Beverly Caribou Protection Area was kept to a minimum since no mineral exploration occurred within the Beverly Protection Area. Two flights (13.3 hours) were conducted over this area in order to define the calving ground boundaries, and to document the post-calving movement towards the Thelon Game Sanctuary.

More intensive caribou monitoring was carried out over the Kaminuriak Caribou Protection Area since mineral exploration sites (active and inactive) were present within this area. Nearly 70% (27.7 hours) of the total flying time was used to monitor the Kaminuriak herd (9 flights). Three, 5.4, and 19.3 hours were allocated to the pre-calving, calving and post-calving periods, respectively. Table 1 shows the schedule and rationale for flights.

The location of caribou concentrations were marked on 1: 500,000 scale topographic maps. During flights at calving time, estimates of caribou abundance were recorded every 2 minutes in order to determine caribou densities. Based on caribou numbers

Table 1. Schedule and rationale for 1990 caribou monitoring flights.

| Date | Hours | Rationale |
|---|---|---|
| 16 May | 1.1 | 1) To investigate potential caribou activity in the vicinity of Inco Gold site. |
| 23 May | 1.9 | 1) To identify pre-calving movements and progress of Kaminuriak caribou and to investigate potential caribou activity around the calving ground area south of Banks Lake. 2) To fly over 2 inactive land use sites (Borealis Exploration; Sikaman Gold Resources, Kaminak Lake). |
| 8 June | 1.8 | 1) To fly a broad flight pattern over the traditional calving area of Kaminuriak herd in order to locate the major components of calving caribou. |
| 9 June | 3.6 | 1) To fly over the Kaminuriak calving area to identify the calving ground boundaries. 2) To fly near 2 inactive land use sites (Sikaman Gold Resources, Maze Lake area; Noble Peak Resources). |
| 10 June | 6.7 | 1) To fly over the Beverly Caribou Protection Area in order to define the calving ground boundaries. 2) To fly over 2 sections of the Kaminuriak Caribou Protection Area, calving area and northeastern part respectively, to evaluate proportion of cows-calves and to investigate for caribou activity. |

Table 1. (continued)

| Date | Hours | Rationale |
|---|---|---|
| 16 June | 3.8 | 1) To fly in the vicinity of the Kaminuriak calving area to investigate the first post-calving movements. 2) To fly over 2 inactive land use sites (Sikaman Gold Resources, Maze Lake area; Noble Peak Resources). |
| 24 June | 1.3 | 1) To investigate any caribou activity (post-calving period) in the general vicinity of the I.N.A.C. planned flight line to the Borealis Exploration inactive land use site. |
| 25 June | 3.2 | 1) To investigate progress of the Kaminuriak herd towards post-calving areas. 2) To fly near 3 inactive land use sites (Sikaman Gold Resources, Kaminak Lake and Maze Lake areas; Noble Peak Resources). |
| 28 June | 6.6 | 1) To fly over and outside (western boundary) the Beverly Caribou Protection Area in order to investigate progress of the herd towards post-calving areas. 2) To fly over the northern part of the Kaminuriak Caribou Protection Area to investigate any caribou activity along the flight line. 3) To fly near 2 inactive land use sites (Urangesellschaft, Deep Rose Lake area; PNC Exploration). |
| 29 June | 3.9 | 1) To pursue monitoring of post-calving movements of the Kaminuriak herd towards the southern portion of the Protection Area. 2) To investigate any caribou activity in 2 inactive land use site areas (Inco Gold; Sikaman Gold Resources, Maze Lake area). |

Table 1. (continued)

| Date | Hours | Rationale |
|---|---|---|
| 5 July | 4.1 | 1) To investigate the progress of Kaminuriak post-calving movements in the southern part of the Protection Area. 2) To specially fly over the coastal area near Pistol Bay where several groups of caribou were observed outside the Protection Area on 29 June. 3) To fly over the northwest section of the Protection Area, which has not been flown over so far, to investigate any caribou activity. 4) To fly in the vicinity of both inactive Sikaman Gold Resources land use sites. |
| 13 July | 4.3 | 1) To fly over the portion of the Protection Area roughly located between Kaminak Lake, Maguse Lake and the Hudson Bay coast, and in the vicinity of the southern Protection Area boundaries to investigate progress of Kaminuriak cows and calves by the end of the monitoring period. |

between marked locations, 3 relative density areas were defined: low, moderate, and high which corresponded respectively to less than 50 caribou, 50 to 100, and 100 to 2,000 in the Beverly calving area. The number of Kaminuriak caribou in the low, moderate, and high density areas were respectively less than 200, 200 to 1,000, and 1,000 to 5,000. Areas were determined with a zero setting compensating planimeter.

Weather information (temperature, wind, visibility, cloud), as well as snow and ice conditions, were regularly recorded along the flight line. Human activity and sightings of other wildlife species (Appendix C) were also noted. Recommendations regarding land use releases were based on guidelines outlined by Darby and Williams (1979). In responding to a release request, an area within a 10 km radius was investigated for the presence of caribou around a land use site.

In addition to a verbal report, monitoring observations were documented in the form of a flight report (Appendix B) which was provided to the District Manager (within 2 to 5 days) following each flight. Caribou monitoring data were subsequently summarized and presented on maps. Numbers of caribou in post-calving concentrations appearing on maps were rounded off to the nearest hundred.

# RESULTS AND DISCUSSION

## Beverly Caribou

### Spring Migration

Beverly caribou wintered southeast of the East Arm of Great Slave Lake (D. Heard pers. comm.). Most of the herd was distributed in that area, southeast of Snowdrift and Reliance as well as northwest of the Snowdrift River, at the end of March (M. Williams pers. comm.). Thousands of caribou were also reported to have wintered in the Thelon River, Aberdeen Lake, Schultz Lake area (R. Bourget pers. comm.). It was unclear whether these caribou belonged to the Beverly herd or to the Wager Bay herd. However, caribou were seen migrating eastwards to Tehek Lake and Quoich River from this latter wintering area in early spring (R. Bourget pers. comm.). Baker Lake hunters reported that caribou were migrating northwards from the Schultz Lake area at the beginning of May (R. Bourget pers. comm.). The presence of tracks suggested that caribou wintering in the Schultz Lake area may have reached the Beverly calving ground via the east section of the Protection Area.

No specific monitoring flight was conducted to investigate the Beverly herd spring migration routes. The first monitoring flight over the Beverly Protection Area was conducted on 10 June (Fig. 2). Although the flight rationale was to investigate the calving area, it provided some information on spring migration routes. Light to

moderate tracks oriented NW-SE and W-E were observed in the northwest part of the Protection Area along the Upper Garry River (Fig. 6). These tracks suggested that caribou likely approached the calving area by the west and northwest sections of the Protection Area after traveling northwards through the Thelon Game Sanctuary. This pattern of spring migration has been documented several times in the past (Chalmers 1989; Ogilvie 1989, 1987; Liepins 1986; Duquette 1985; Bradley and Gates 1984; Clement 1983, 1982; Cooper 1981; Darby 1980, 1978).

In addition to this major spring migration route, some caribou might have travelled into the calving area from the east or the southeast section of the Protection Area as suggested by sightings of small groups of caribou and tracks (light to moderate) oriented NE-SW in that area, as well as the quasi absence of caribou and tracks in the northeast section of the survey area. This migration route of lesser importance was also reported in 1989 (Chalmers 1989). It is likely that these caribou belonged to smaller groups which wintered apart (i.e., Schultz Lake area) from the main herd.

Calving Grounds

A monitoring flight was conducted on 10 June to define the boundaries of the Beverly calving ground. By that date, we judged that approximately 50% of females were accompanied by calves. The calving ground was located 20 km northwest of Sand Lake (Fig. 6). A moderate density area spreading southwestwards from the high density area suggests that the calving area may have extended

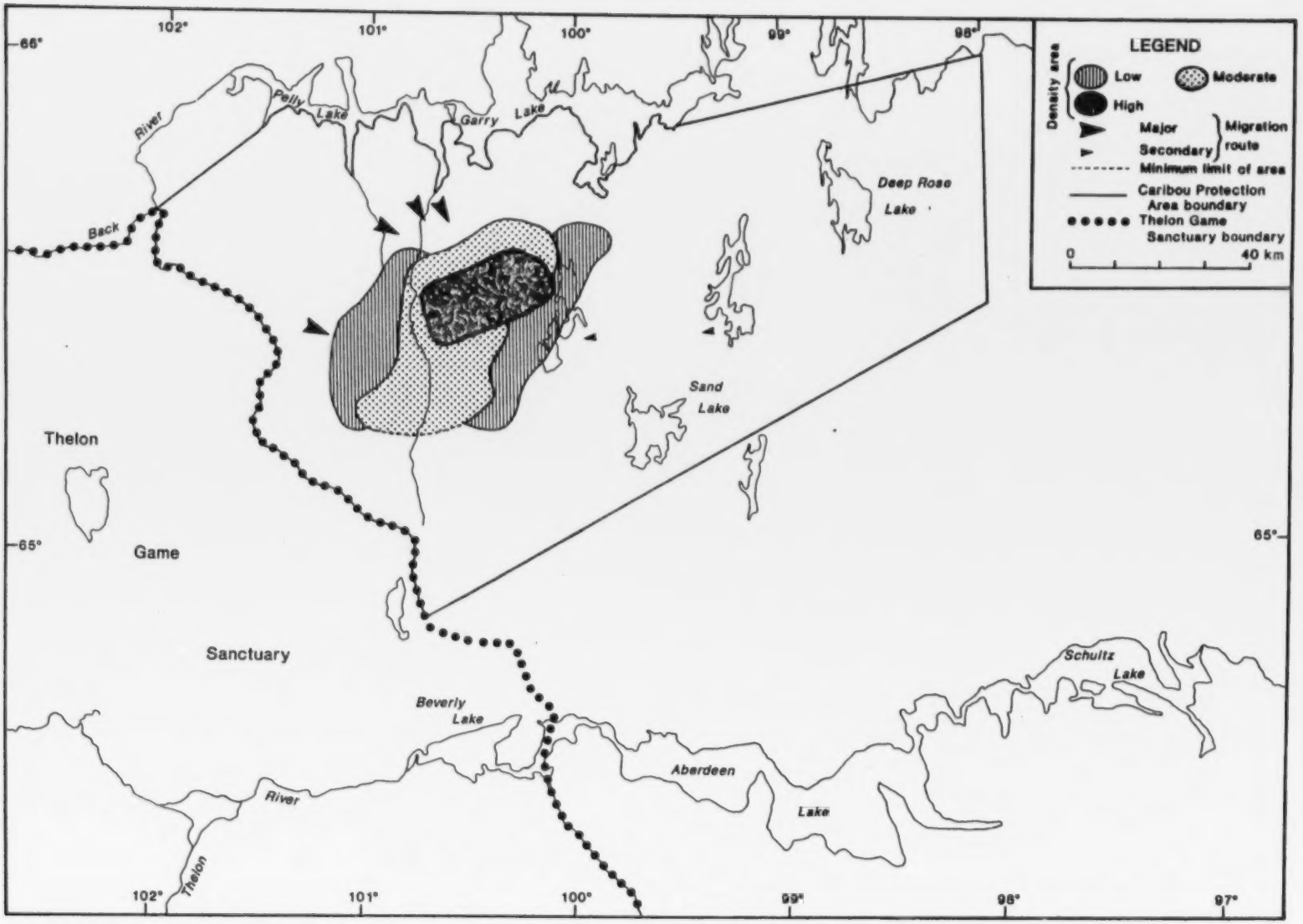


Figure 6. 1990 Beverly herd pre-calving migration routes and calving area.

further southwest towards the Protection Area boundary. However, this distribution could not be confirmed by this flight. The moderate and low caribou density areas were of 830 $km^2$ and 825 $km^2$, respectively.

Eight thousand (8,011) caribou, mostly cows, were seen on this flight, with nearly 80% observed in the high density area. Caribou scattered over the snow free areas usually in small and medium groups of 15 to 300 individuals. The snow cover varied between 60% and 80% in the Protection Area on 10 June.

The Beverly calving ground was confined within the Protection Area and was much the same as in 1989 (Chalmers 1989). Last year, however, the east boundary reached Sand Lake, and the high caribou density area was located slightly further south (10 km). Previously, the calving grounds in 1985 (Duquette 1985), 1984 (Bradley 1985), 1981 (Clement 1982), and 1978 (Darby 1978) had also been located northeast of the Thelon Game Sanctuary. However, these calving areas extended further eastwards. In 1986 (Liepins 1986), the Beverly herd calved in much the same area as in 1990. Prior to 1978 (Darby 1978), the Beverly cows calved to the southeast, in the southeast Sand Lake area, and southward towards the Beverly Lake area.

Post-Calving Movements

On 28 June, a monitoring flight (Fig. 2) was conducted in order to investigate the progress of the herd towards the post-calving areas. By this date, 97.5% of the cows with calves seen (est. 18,369) were in the southwest extremity of the Protection Area. The majority of these animals (85%) were located outside the Protection Area, in the Thelon Game Sanctuary (Fig. 7), although a group of 500 individuals was located adjacent to the eastern boundary of the Sanctuary. Caribou were scattered in large groups ranging from several hundred (200 to 900) to several thousand (1,000 to 4,000). Less than 10 caribou were observed in the calving area on 28 June.

The location of these large post-calving aggregations, combined with the presence of heavy, fresh tracks oriented NE-SW in the same area, and the quasi absence of caribou and tracks elsewhere in the Beverly Protection Area, strongly suggest that the Beverly cows and calves were migrating south into the Thelon Game Sanctuary at the southwest corner of the Protection Area. Historically, this post-calving movement to the southwest has occurred several times (Ogilvie 1987; Liepins 1986; Bradley and Gates 1984; Clement 1983, 1982; Cooper 1981; Darby 1980, 1978).

No further monitoring flights were conducted over the Beverly Protection Area. Caribou were expected to be within the Thelon Game Sanctuary a few days later, in early July.

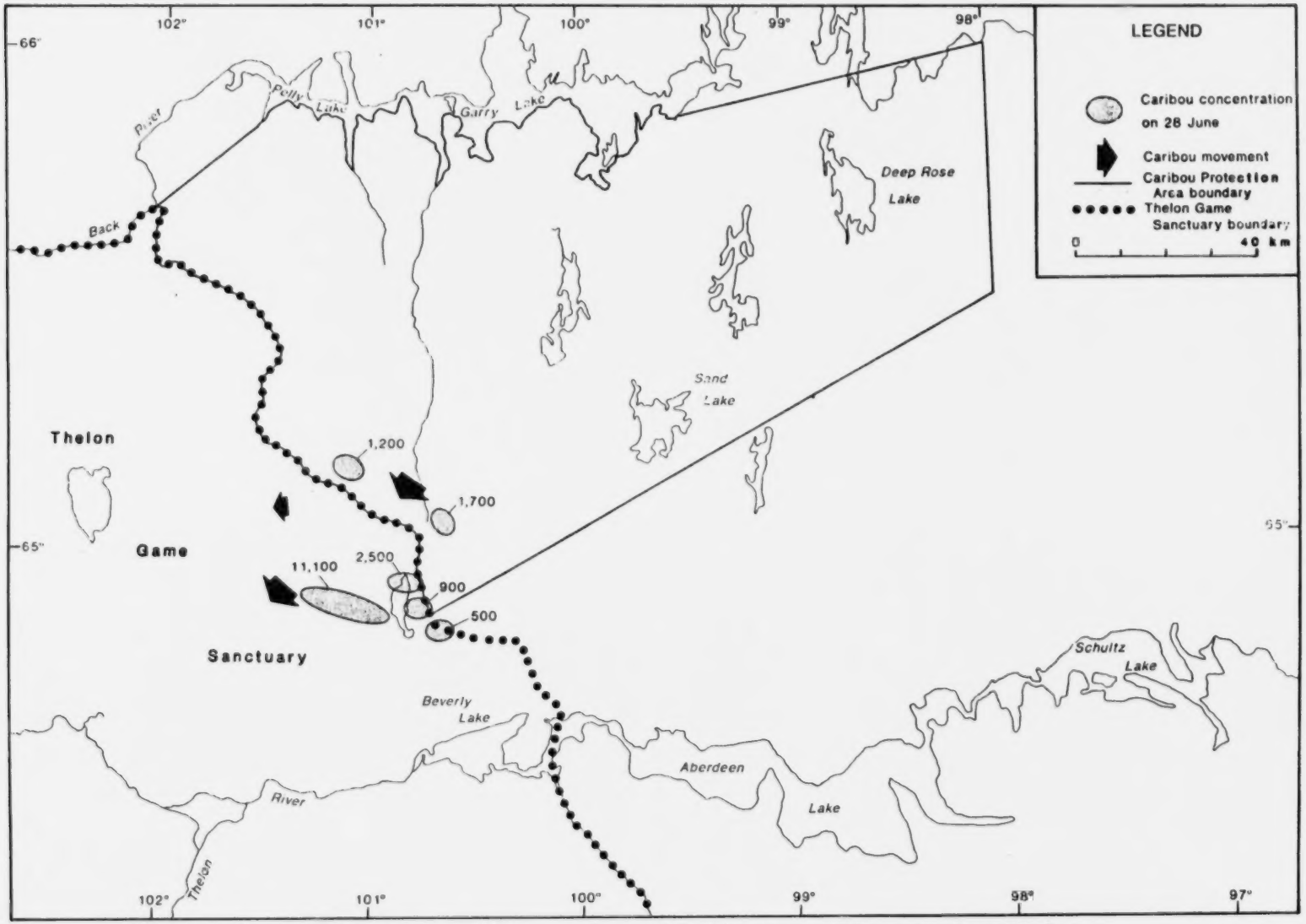


Figure 7. Beverly caribou concentrations and post-calving movements in late June, 1990.

## Kaminuriak Caribou

### Spring Migration

According to S. Kerney (pers. comm.), Kaminuriak caribou did not winter as far south in Manitoba as was observed in the last 4 or 5 years. Caribou in any significant numbers were only seen in the extreme northwest corner of Manitoba last winter. In north central Manitoba only scattered groups of caribou were observed during the course of the winter. These observations are consistent with what community residents in Lac Brochet and Tadoule Lake observed. Therefore, it is likely that the main herd wintered in the southern Keewatin. J. Savikataaq (pers. comm.) reported that Kaminuriak caribou wintered around Hicks Lake (61°25'N X 99°55'W) and Watterson Lake (61°12'N X 99°25'W), north of Nueltin Lake. Caribou were seen coming from this area during the Spring Classification survey conducted by Renewable Resources in the north Fitzpatrick Lake and south Hawk Hill Lake area (61°00'N X 98°40'W) in April.

In late April, caribou were observed migrating to Maguse Lake from the north Hurwitz Lake (60°50'N X 98°00'W) and south Henik Lake (61°28'N X 97°25'W) area, and from the middle to the north end of Maguse Lake in the Protection Area a few weeks later, in mid-May (J. Savikataaq pers. comm.). By 21 May, many caribou were scattered around Carr Lake and Turquetil Lake, and numerous caribou trails were present in this area (J. Savikataaq pers. comm.).

The monitoring flight conducted on 23 May over the south center of the Protection Area (Fig. 3), revealed moderate to heavy caribou tracks oriented SW-NE in the Kaminak Lake area, and S-N between Duffy Lake and Derby Lake. By late May, the main portion of the herd was progressing north into the Banks Lake area with many animals moving into the Protection Area via the southwestern part of Kaminak Lake (Fig. 8). This pattern of approach from the southwest has been common over the last ten years (Chalmers 1989; Ogilvie 1989, 1987; Liepins 1986; Duquette 1985; Bradley 1985; Bradley and Gates 1984; Cooper 1981; Darby 1980, 1978).

Several secondary migration routes were used by caribou to move into the calving area as indicated by several sightings of caribou tracks (light to moderate) oriented S-N and SW-NE in the Copperneedle River and in the O'Neil Lake areas, respectively.

Caribou did not migrate along the Hudson Bay coast, past Arviat, in 1990 (M. Bradley pers. comm.); however, one small group of 15 caribou was seen on 16 May in the Dawson Inlet area. On 23 May, 4 groups (N = 40) were observed south of Last Lake, ca. 30 km inland from Dawson Inlet. At the same time, small groups of bulls and yearlings were sighted by local people along coastal areas (Fishery Lake, Sandy Point, Meliadine Lake).

Some Kaminuriak caribou may have also wintered in the Baker Lake area as occasionally occurred in the past (Clement 1982, 1983; Ogilvie 1989). Caribou located south of Baker Lake at the end of March were reported moving southwards (R. Bourget pers. comm.), likely heading for the Kaminuriak Protection Area. However, on 8

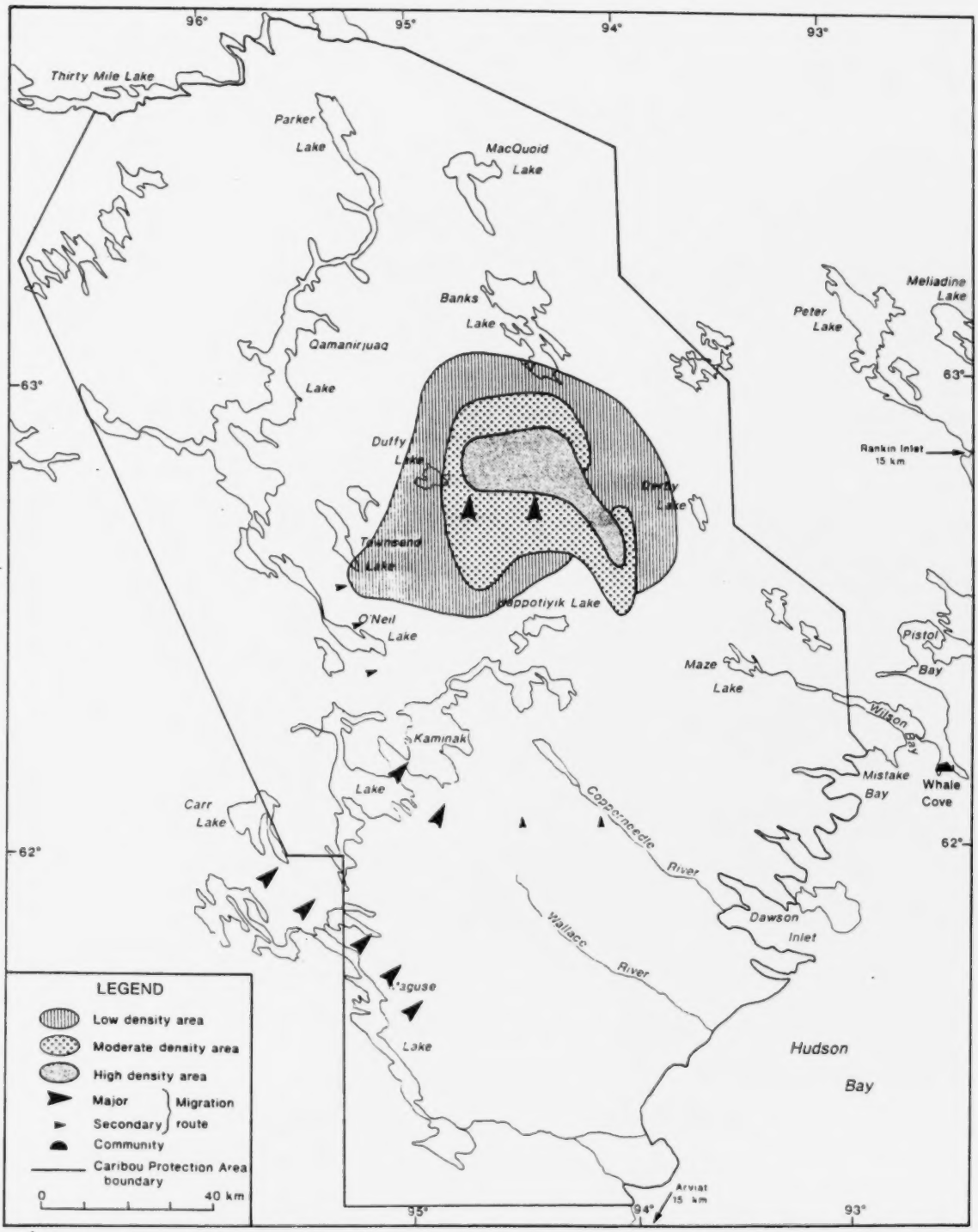


Figure 8. 1990 Kaminuriak herd pre-calving migration routes and calving area.

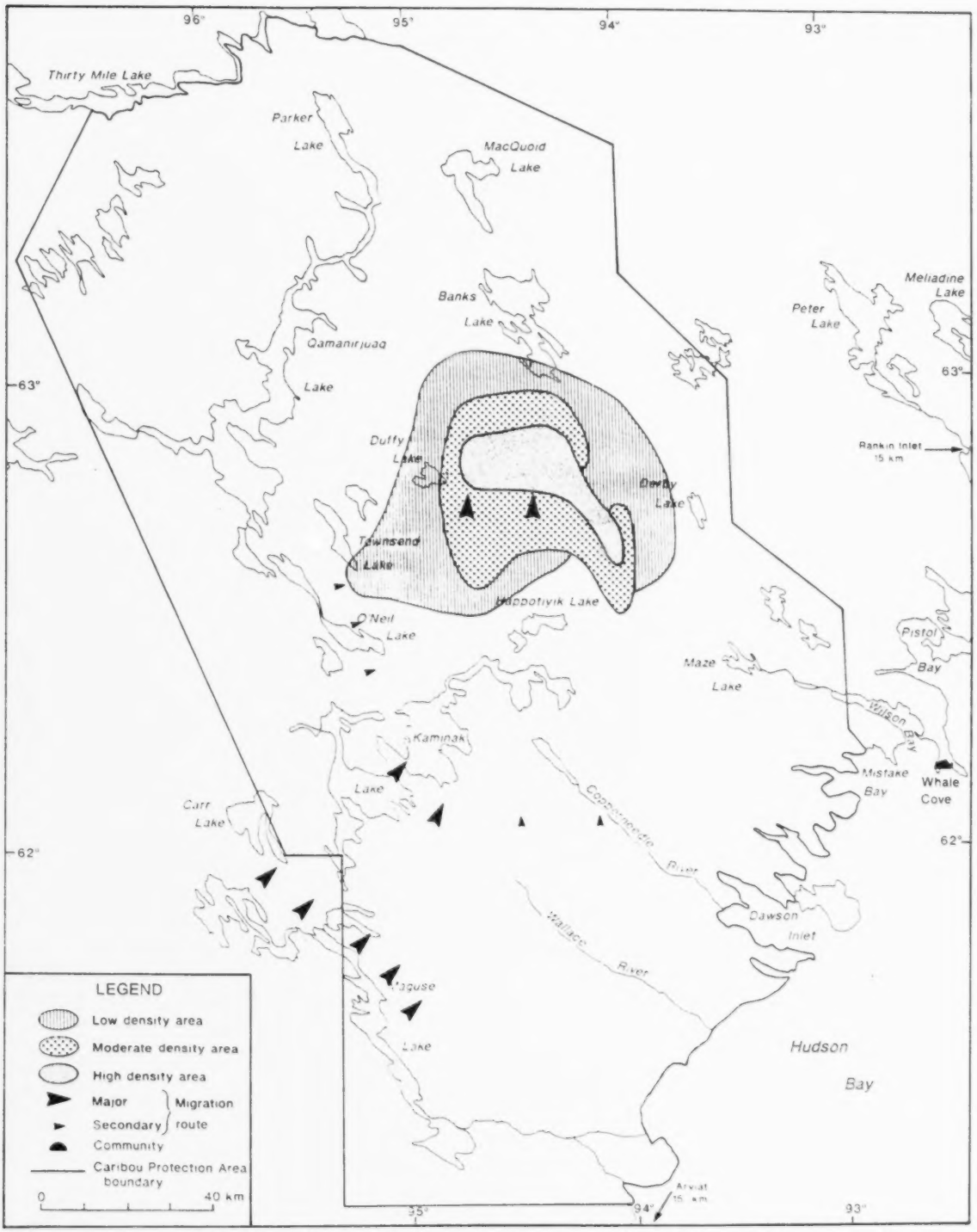


Figure 8. 1990 Kaminuriak herd pre-calving migration routes and calving area.

June, no caribou tracks were seen approaching the calving area from the north along the northeast Qamanirjuaq Lake and north Banks Lake areas.

Caribou were also present around the community of Baker Lake at the beginning of March (R. Bourget pers. comm.). In late May, Baker Lake people reported seeing caribou moving from the Pitz Lake area (63°58'N X 96°35'W). These caribou, heading to the northeast, were seen crossing the southwest part of Baker Lake near the community (D. Oolooyuk and G. Leprieur pers. comm.) and were likely part of the Lorillard and Wager herds.

Calving Grounds

On 23 May, a little over one hundred (127) caribou were observed between Derby and Duffy lakes. On a reconnaissance flight conducted on 8 June in the Banks Lake area (Fig. 3), nearly thirty-three thousand caribou (32,765; 98.5% of the estimated total), mostly cows, were sighted between Derby and Duffy lakes. The proportion of females with calves was estimated to be at least 10%.

The calving ground boundaries were delineated on 9 June. The calving area extended as far east as Derby Lake, north to the southern part of Banks Lake, west to Mandreville and Townsend lakes, and south to Happotiyik Lake. A higher density area (480 $km^2$) was located northeast of Duffy Lake, and extended southeastwards to the east of Happotiyik Lake (Fig. 8). Moderate and low density areas were estimated at 1,070 $km^2$ and 1,840 $km^2$, respectively.

Caribou were scattered in group sizes ranging from several individuals to groups of several thousand over an area with 10% snow cover. We estimated that at least 25% of females were accompanied by calves on 9 June. While on the way to the Beverly Protection Area on 10 June, it appeared that 65% of Kaminuriak cows had calves. Therefore, the peak of calving was reached by 10 June. Later, monitoring flights indicated that at least 75% and 80% of females were with calves on 16 and 24 June, respectively. As with past calving ground distributions (Chalmers 1989; Ogilvie 1989, 1987; Liepins 1986; Duquette 1985; Bradley 1985; Bradley and Gates 1984; Clement 1983, 1982; Cooper 1981; Darby 1980, 1978), in 1990 the Kaminuriak cows again returned to their traditional calving ground located in the Qamanirjuaq and Banks lakes area.

The 1989 (Chalmers 1989) and 1987 (Ogilvie 1987) calving areas, were centered further north (Banks Lake area) and south (Happotiyik Lake area), respectively. Prior to 1987, the Kaminuriak calving area was occasionally located east of Qamanirjuaq Lake and south of Banks Lake (in 1985, Duquette 1985; in 1980, Cooper 1981; in 1978, Darby 1978), but did not extend eastwards as it did in 1990.

Post-Calving Movements

Between 15 June and 15 July, 5 monitoring flights plus 1 flight with I.N.A.C. were conducted over the Kaminuriak Caribou Protection Area to investigate the progress of post-calving

caribou. The number of caribou estimated per flight appears on Table 2.

By 16 June, large concentrations (several hundred to a thousand individuals) of Kaminuriak cows and calves were still present in the calving area, between Duffy and Derby lakes (Fig. 9). Seventy-six percent (76.6%) of the total number of caribou on this flight were observed within this area. More than three thousand (3,742) caribou were estimated between Derby Lake and Maze Lake suggesting that a portion of the Kaminuriak cows and calves had started a movement towards the coastal area by mid-June. Other small groups mainly of yearlings (less than 20 individuals) were seen in the Happotiyik Lake area, and in the large complex Mandreville - Townsend - O'Neil lakes, at the southwest edge of the calving ground. By mid-June, bulls and yearlings were also present in the southern section of the Protection Area (southwest of Maguse Lake, north shore of Dionne Lake; B. Kovic pers. comm.).

By 25 June, cows and calves had left the calving area located south of Banks Lake, between Duffy and Derby lakes. Several groups (100 to 300 individuals) congregated south of the calving area, east of Happotiyik and Snug lakes (Fig. 9). Caribou were scattered along the flight line in the Mandreville, Townsend and Victory lakes area, and west of Happotiyik Lake. Frequent sightings of bulls and yearlings were reported within these small groups of less than 25 individuals.

Table 2. Caribou sighted per monitoring flight between 15 June and 15 July, 1990 over the Kaminuriak Caribou Protection Area.

| Date | Number of caribou counted |
|---|---|
| 16 June | 27,791 |
| 24 June | 5,718[a] |
| 25 June | 4,821[b] |
| 29 June | 34,380 |
| 05 July | 51,885 |
| 13 July | 33,300 |

a I.N.A.C. flight; coastal area
b interrupted monitoring flight

On 24 June, a few large groups (300 to 2,000 individuals) of cows with calves were dispersed between Whiterock Lake (62°20'N X 93°10'W) and Last Lake (62°15'N X 93°45'W), southeast of Maze Lake (Fig. 9). Caribou were still present in this coastal area on 26 June, although a small group of 400 cows accompanied by calves were seen slightly further northeast in the Gill Lake area (62°27'N X 93°10'W), east of Maze Lake (S. Mitchell pers. comm.). These observations, combined with sightings of heavy caribou tracks east of Happotiyik Lake (oriented W-E and NW-SE) observed on 25 June, confirmed the southwestward post-calving movement to the Hudson Bay coast area which had begun by mid-June.

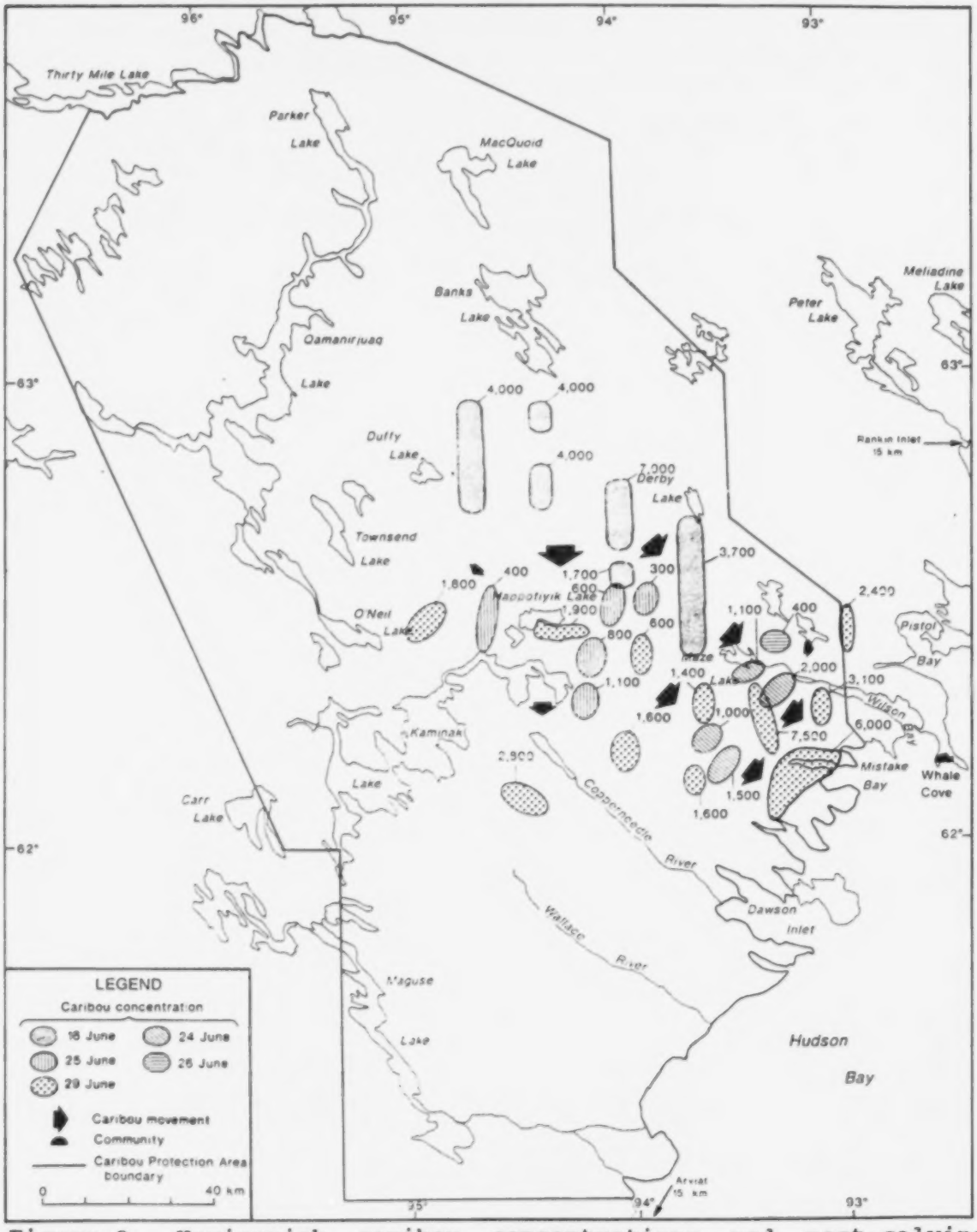


Figure 9. Kaminuriak caribou concentrations and post-calving movements between mid and late June, 1990.

By 29 June, Kaminuriak cows and calves were located between Kaminak Lake and the Hudson Bay coast, and south of Happotiyik Lake (Fig. 9). Caribou were scattered in group sizes ranging from 10 to groups of several thousand, the latter being mainly located in the coastal area. The large aggregations of cows with calves observed southeast of Maze Lake on 25 June, had moved further towards the coast, and were located behind Wilson Bay and Mistake Bay. Several groups of caribou were still present in the Happotiyik Lake area, most of them congregating, however, on the south side of this lake ca. 60-70% ice-covered. Radio tracking equipment was in operation during this flight to help locate major groups of caribou. All radio collar signals (6) received were found within large concentrations of caribou along the flight line. Bulls and yearlings were sighted among the small scattered groups (less than 30 individuals) observed in the south section of the Protection Area, between the Copperneedle River and Maguse Lake.

By 5 July, several groups of 200 to 4,000 cows and calves were still present between Happotiyik Lake and Maze Lake (Fig. 10). Unlike the previous monitoring flight (29 June), only a few groups of caribou were observed in the coastal area, south of Maze Lake. More than half (54%; 28,000 caribou) of the total estimate of caribou on this flight congregated on the east side of Kaminak Lake which was 80% ice-covered. Eleven large groups of several thousand caribou (1,000 to 8,000) were scattered in this area. With few caribou in the coastal area, and their presence east of Kaminak Lake, it is believed that a major part of the herd had shifted

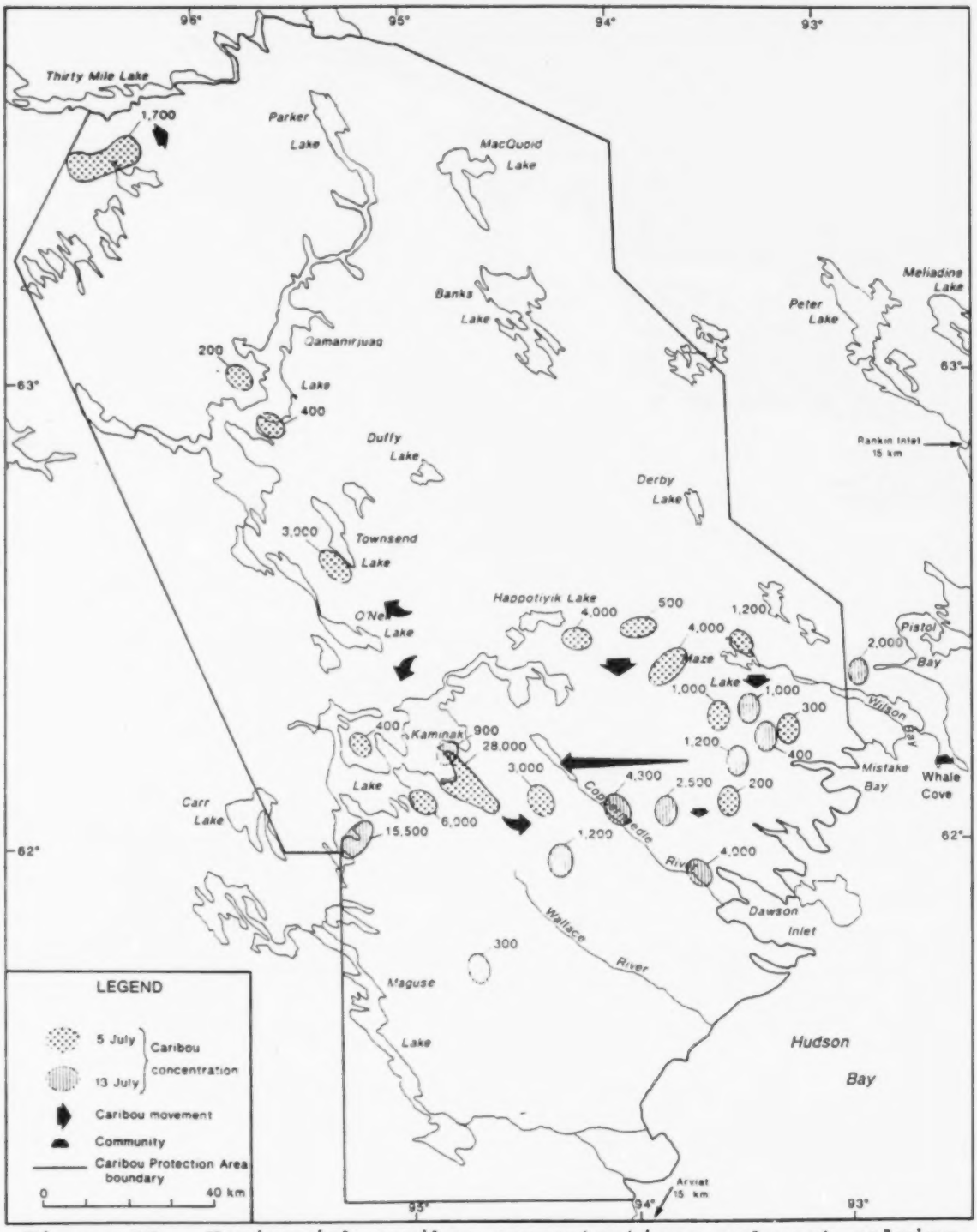


Figure 10. Kaminuriak caribou concentrations and post-calving movements between early and mid-July, 1990.

inland by 5 July. Numerous fresh tracks oriented E-W along the eastern transects in the coastal area seemed to confirm this westward post-calving movement. Caribou were formed into large concentrated post-calving aggregations on 5 July.

By 13 July, the majority of Kaminuriak cows and calves were still dispersed in the Protection Area, although a group of 2,000 cows with calves was sighted outside the Protection Area near Whale Cove. Caribou had left the Happotiyik Lake and Maze Lake areas by 13 July, and were scattered in several groups of 300 to 9,000 individuals along the coastal area between Whiterock Lake and Wallace River, as well as on the east side of Kaminak Lake (Fig. 10). Nearly half (49.2%) of the caribou were located in that latter area, and had slightly moved westwards since 5 July. An estimated 25,000 caribou (in 2 groups) were seen east of Yathkyed Lake and south of Ferguson Lake (west of Kaminak lake) on 24 July (H. Kablalik pers. comm.).

More than two thousand (2,175) cows with calves consisting of several small groups of less than 50 individuals to several hundred (100 to 800), were reported to be just outside the Protection Area, behind Pistol Bay by 29 June (Fig. 9). The presence of these caribou outside the Protection Area was not confirmed on the 5 July flight. However, one large group of 2,000 cows with calves was observed ca. 30 km northwest of Whale Cove on 13 July (Fig. 10).

The post-calving movement of Kaminuriak cows and calves to the south and southeast, fits the pattern of movement over the past ten years (Chalmers 1989, Ogilvie 1989, Liepins 1986, Duquette 1985,

Bradley 1985, Bradley and Gates 1984, Clement 1982, Cooper 1981). Although a part of the herd had moved inland by the first week of July, a significant proportion of caribou still occupied the coastal area, between Wilson Bay and Dawson Inlet, by mid-July. The presence of numerous caribou in that coastal area by mid-July was also reported in 1987 (Ogilvie 1987). In previous years, the bulk of Kaminuriak cows and calves have converged further southeast along the coast and/or inland by mid-July (Chalmers 1989; Ogilvie 1989; Liepins 1986; Duquette 1985; Bradley 1985; Bradley and Gates 1984; Clement 1983, 1982; Cooper 1981; Darby 1980, 1978). The presence of several thousand caribou between Maguse River and Arviat at the end of July (J. Savikataaq pers. comm.), suggests that caribou dispersed along the coast by mid-July and moved further south by the end of July.

In addition to these major post-calving movements (south and southeast), a smaller southwestward post-calving movement may have occurred from the calving area, as indicated by the presence of several groups of caribou (100 to 400 individuals) east of O'Neil Lake by 29 June (Fig. 9). The presence of 400 cows with calves on the west side of Kaminak Lake on 5 July (Fig. 10) suggests that this post-calving movement to the southwest might have been pursued by a small portion of the Kaminuriak cows. Sightings of several thousand caribou in the Qamanirjuaq Lake and Townsend Lake area suggest that some caribou were also migrating to the northwest by the end of June. A group of 1,000 caribou was seen crossing a small river at the southeast tip of Townsend Lake heading

northwest. Post-calving movements to the west, northwest, and north have been frequently documented since 1978. An investigation of the northern section of the Kaminuriak Caribou Protection Area on 28 June revealed that ca. 200 caribou were scattered in the large area bounded by Thirty Mile Lake, Parker Lake, Macquoid Lake, and the north of Qamanirjuaq Lake. Although bulls and yearlings were frequently observed in these groups, a few cows and calves were also seen. A few of these cows were located around Bisset Lake, north of the Protection Area boundary. Several smaller groups of 15 to 300 individuals, primarily bulls and yearlings, were also present at the northwest extremity of the Protection Area, south of Thirty Mile Lake, on 5 July. A group of ca. 1,000 caribou heading north was also reported in the Thirty Mile Lake area in mid-July (R. Bourget pers. comm.). Two large groups of caribou were spotted along the Kazan River by a group of canoeists at the end of July (B. Loewen pers. comm.). One group of 5,000 caribou was located west of Thirty Mile Lake (63°37'N X 97°00'W) heading to the southwest. A second group of ca. 20,000 caribou was crossing to the south at the west extremity of this lake (63°37'N X 96°45'W).

Since 1978, observations of caribou in the Kazan River - Thirty Mile Lake area, by the end of July, have been reported yearly. The groups in that area were frequently reported to comprise bulls and yearlings. For the 1990 monitoring period, bulls and yearlings were mainly observed south, west and northwest of the calving area. From late June to the end of July, many

sightings of small numbers of caribou near Rankin Inlet (within ca. 20 km radius) were reported by local people. These scattered groups of a few hundred caribou in total, were mainly made up of bulls and yearlings. The presence of bulls and yearlings on the periphery of the mainly cows and calves concentration area may be an accidental isolation by the break-up of ice, bulls and yearlings having lagged far behind the cows during the spring migration (Kelsall 1968). According to the authors, it may also be an attraction to better vegetation, calving areas being usually poorly vegetated.

# LAND USE ACTIVITY

Thirteen Land Use Permits (Table 3), compared to 21 in 1989 (Chalmers 1989), were issued authorizing companies to operate in areas potentially used by Beverly and Kaminuriak caribou between 15 May and 15 July: 4 permits within the Kaminuriak Caribou Protection Area, and 9 outside but in the vicinity of both Protection Areas (Fig. 11).

## Caribou and Active Land Use Sites

### Within Caribou Protection Areas

No Land Use Permits were issued within the Beverly Caribou Protection Area. One mineral exploration company, Inco Gold Management, was active for 4 days during the monitoring period in the Kaminuriak Caribou Protection Area. In mid-May Inco moved their camp equipment to Dawson Inlet from the previous site (62°19'N X 92°51'W) in the Wilson Bay area. This operation was done via the sea ice which the Caribou Protection Measures did not cover. Therefore, no release was requested by Inco for this period. A monitoring flight on 16 May found no major concentrations of caribou in the vicinity of this land use site. Fifteen caribou were observed within a 10 km radius around the Inco Gold camp on 16 May. This land use site was inactive for the remainder of the monitoring period. No requests for release were received in 1990 by the I.N.A.C. District Office for the Kaminuriak

Table 3. Mineral exploration sites within or near the Caribou Protection Areas, Keewatin, 1990.

| Permit# exp. date | Company | Location | Activity |
|---|---|---|---|
| **KAMINURIAK CARIBOU PROTECTION AREA** | | | |
| N88C926 Sept 28/90 | Inco Gold Management Inc. | Northwestern arm of Dawson Inlet (61°55'10"N X 93°37'W) | Gold exploration; diamond drilling; geological and geophysical survey; prospecting |
| N89C097 Mar 29/91 | Noble Peak Resources Ltd. | Happy, Quartzite and Kaminak Lakes (62°24'N X 94°37'W) | Gold exploration; diamond drilling; mapping; geochemical sampling; prospecting |
| N89C142 June 30/90 | Sikaman Gold Resources Ltd. | Maze Lake Area (62°22'N X 93°38'W) | Gold exploration; May 15 - July 15: personnel for maintenance only; after July 15: mapping, prospecting, sampling, drilling (Bowser L.) |
| N90C315 Apr 03/92 | Sikaman Gold Resources Ltd. | Kaminak Lake Area (62°14'30"N X 95°10'W) | Gold exploration; geological mapping; prospecting; trenching; sampling (July 15 - Sept 15) |
| **BEVERLY CARIBOU PROTECTION AREA** | | | |
| None | | | |
| **ADJACENT TO CARIBOU PROTECTION AREAS** | | | |
| Kaminuriak caribou area vicinity | | | |
| N88C908 Mar 31/91 | BHP-Utah Mines Ltd. | Kaminak Lake (61°53'N X 95°29'W) | Gold exploration; diamond drilling; geological mapping; prospecting; sampling |

Table 3. (continued)

| Permit# exp. date | Company | Location | Activity |
|---|---|---|---|
| N88C917 Sept 29/90 | Dejour Mines Ltd. | Turquetile Lake (62°09'N X 96°37'W) | Gold exploration; diamond drilling |
| N88J944 May 26/90 | Comaplex Mineral Corp. | S-E Baker Lake (63°39'N X 94°33'W) | Gold exploration; geological and geochemical mapping; geological surveys; prospecting |
| N89J133 May 23 | Wollex Exploration | Meadowbank River area (65°13'N X 96°15'W) | Gold exploration |
| N89J266 Oct 15/90 | Asamera Minerals Inc. | Meliadine Lake area (62°56'N X 91°55'W) | Gold exploration; Stage I: June 1 to July 31 |
| N90J269 Feb 13/92 | Noranda Exploration | Bisset Lake area (63°46'N X 95°02'W) | Gold exploration |
| <u>Beverly caribou area vicinity</u> | | | |
| N89J109 June 29/91 | Urangesell-schaft (Canada) Ltd. | Deep Rose Lake Area (65°15'N X 98°34'W) | Uranium exploration; geological and geophysical surveys |
| N89J137 Sept 30/90 | PNC Exploration (Canada) Co. Ltd. | Schultz Lake Area (64°32'N X 97°32'W) | Uranium exploration |
| N90C313 N90C314 Apr 30/92 | Urangesell-schaft (Canada) Co. Ltd. | Kiggavik Area Pointer L. Area (64°26'N X 97°39'W) | Uranium exploration; geological and geophysical surveys; diamond drilling; small environmental surveys |

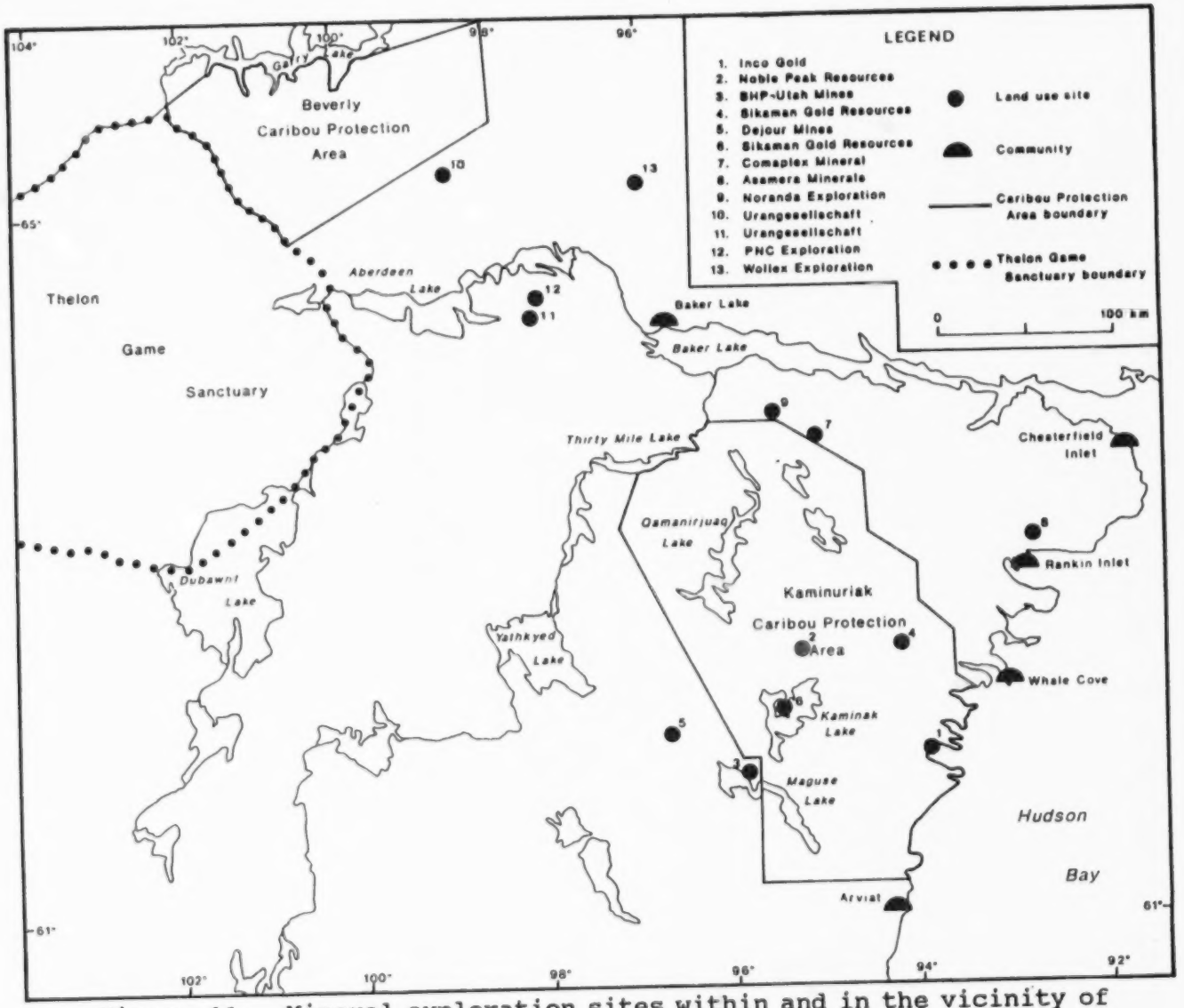


Figure 11. Mineral exploration sites within and in the vicinity of Caribou Protection Areas, Keewatin Region, 1990.

Caribou Protection Area, compared to 6 in 1989 (Chalmers 1989).

Adjacent to Caribou Protection Areas

Two mineral exploration companies, located near Caribou Protection Areas, were operating between 15 May and 15 July: Urangesellschaft (Canada) (64°26'N X 97°39'W), and Asamera Minerals (62°56'N X 91°55'W).

While conducting flights to the Beverly Protection Area, few caribou (3 and 5 respectively) were observed around Urangesellschaft site on 10 June, and PNC Exploration (Canada) Co. inactive land use site (64°32'N X 97°32'W) on 28 June. Caribou heading northeastwards to the Aberdeen and Schultz lakes area in late spring suggest that caribou may have passed the Urangesellschaft site area at the beginning of the monitoring period, in mid-May. The lack of a monitoring flight during this period prevented a confirmation of this movement.

Caribou were reported northeast of Rankin Inlet in late June, in an area relatively close to the Asamera Minerals land use site. Based on the size of the groups (several hundred), and the lack of cows with calves within these groups, no monitoring flight was conducted in the vicinity of this land use site. No major conflict between caribou and land users was encountered in this area.

## Caribou and Inactive Land Use Sites

Although many mineral exploration companies were inactive in 1990, data collected during monitoring flights provided information on caribou movements around inactive land use sites.

### Kaminuriak Caribou Protection Area

The Sikaman Gold Resources site, located at Kaminak Lake, was flown over 3 times: on 23 May, on 25 June, and 5 July. Although few caribou were seen in this area in late May, the presence of numerous caribou tracks suggested that many caribou had passed through this area during the spring migration in mid-May. On 5 July, 400 cows and calves were within 5 km of this site, and a major concentration of 28,000 caribou were located on the east side of Kaminak Lake, about 20 km from the Sikaman site.

The Noble Peak Resources site, located on the west side of Quartzite Lake, was flown over on 9, 16, and 25 June. Although no caribou were observed on 9 and 16 June around this land use site, nearly 200 cows and calves scattered in small groups in the vicinity of this exploration site on 25 June. Post-calving movement data indicates that Kaminuriak cows and calves were south of Happotiyik Lake between late June and mid-July, suggesting that caribou were likely present around the Noble Peak Resources site.

During the monitoring period, the Sikaman Gold Resources site at Maze Lake was flown over 5 times: on 9, 16, and 29 June, and on 5 and 13 July. On 16 June, 1,300 cows with calves were scattered

within a 10 km radius around the Sikaman site. On 5 July, at least 3,000 caribou, mostly cows with calves, were present within a 10 km radius around the Sikaman site.

After the monitoring flight on 16 May, over the Inco Gold Management land use site, 2 additional flights were carried out in this area: on 29 June and 13 July. Less than 100 caribou were observed in the vicinity of this site on 29 June. On 13 July, 4,000 cows with calves were seen within 10 km of this site.

These inactive land use sites were located within a sector with interesting geological features which extends from the coastal area, located between Corbett Inlet (62°30'N X 92°20'W) and Dawson Inlet, to Kaminak Lake, through Happotiyik Lake (map EGS 1989-14: Mineral Potential and Geology of the Southeastern Barren Grounds Districts of Keewatin and Mackenzie). As in the past 7 years, this area of mineral interest was intensively used by the bulk of Kaminuriak cows and calves during the post-calving period, as they migrated through between mid- and late May to reach the calving ground. It appears that this section of the Kaminuriak Protection Area is a potential area for frequent caribou/human interactions as indicated by sightings of caribou and tracks in the vicinity of the inactive Sikaman, NPR, and Inco land use sites.

Adjacent to Caribou Protection Areas

No information was collected for 3 inactive land use sites (BHP-Utah Mines, Kaminak Lake; Dejour Mines, Turquetile Lake;

Wollex Exploration, Meadowbank River area) located outside the Protection Areas.

No caribou were observed in the vicinity of 2 other inactive land use sites (Noranda Exploration, Bisset Lake area and Urangesellschaft (Canada), Deep Rose Lake area) on 10 and 28 June respectively.

## WATER CROSSINGS

On 28 June, designated water crossings in the Schultz Lake area were still partially ice-covered. No observations were made or reported for water crossings located in the Beverly caribou summer range.

All rivers were thawed in the Kaminuriak Caribou Protection Area by mid-June. However, the Qamanirjuaq Lake designated crossing was still ice-covered on 25 June. No caribou were present in the vicinity of the designated crossing located between Qamanirjuaq and Mackenzie lakes (62°43'N X 95°45'W) on 5 July. No major water crossings by caribou were reported for the Kaminuriak caribou summer range except for those crossing the western part of Thirty Mile Lake (63°37'N X 96°45'W) on 22 July.

# RECOMMENDATIONS

## Protection Area Boundaries

Boundaries for the Caribou Protections Areas are delineated on the basis of patterns of caribou use in calving and post-calving areas over the previous 5 year period (Mychasiw 1984). Caribou calving grounds and post-calving movements are dynamic and unpredictable, and tend to shift in different directions over several years. The likelihood of encountering cows and calves within the Caribou Protection Areas during the monitoring period is considered to be much higher within the boundary than elsewhere. Any agency interested in pursuing activities within the Keewatin between mid-May to mid-July can study the location of existing Caribou Protection Area boundaries in order to see where cows and calves are likely to be encountered. Therefore, agencies wanting to work within the Caribou Protection Area during the monitoring period must first receive permission from I.N.A.C. and accept a greater risk of having their operations interrupted if a conflict with caribou occurs than outside the Protection Areas where the same regulations apply. In order to provide companies with a similar level of information each year, boundaries are reviewed annually to incorporate recent patterns of caribou use. The size of the Caribou Protection Area may increase, decrease, or remain static.

Beverly Caribou Protection Area

A review of the last five years (1986-1990) of known Beverly caribou distribution, during the monitoring period, indicates that cows and calves either remained within the Beverly Caribou Protection Area, or within the Thelon Game Sanctuary. In late June 1990, large concentrations of cows and calves were seen moving into the Thelon Game Sanctuary, at the extreme southeast corner of the Protection Area (Fig. 7). Although no movements were documented outside these Protection Areas, it should be noted that the level of monitoring for the Beverly range outside area occurred only in the southeast. However, it appears that an area along the eastern edge of the Beverly Protection Area has not been used during the past 5 years. Therefore, we recommend that:

1. A 2,160 $km^2$ area be subtracted from the eastern edge of the Beverly Protection Area, and the boundary moved westwards to longitude 98°45'W (Fig. 12) representing a 16% decrease in the overall size of this Protection Area.

Kaminuriak Caribou Protection Area

Over the past five years, the Kaminuriak calving and post-calving areas have been located primarily within the existing Kaminuriak Caribou Protection Area boundaries. However, a large post-calving aggregation was again located outside the Protection Area, west of Pistol Bay, in late June (Fig. 9) and mid-July (Fig. 10), as occurred last summer. As requested in 1989 (Chalmers

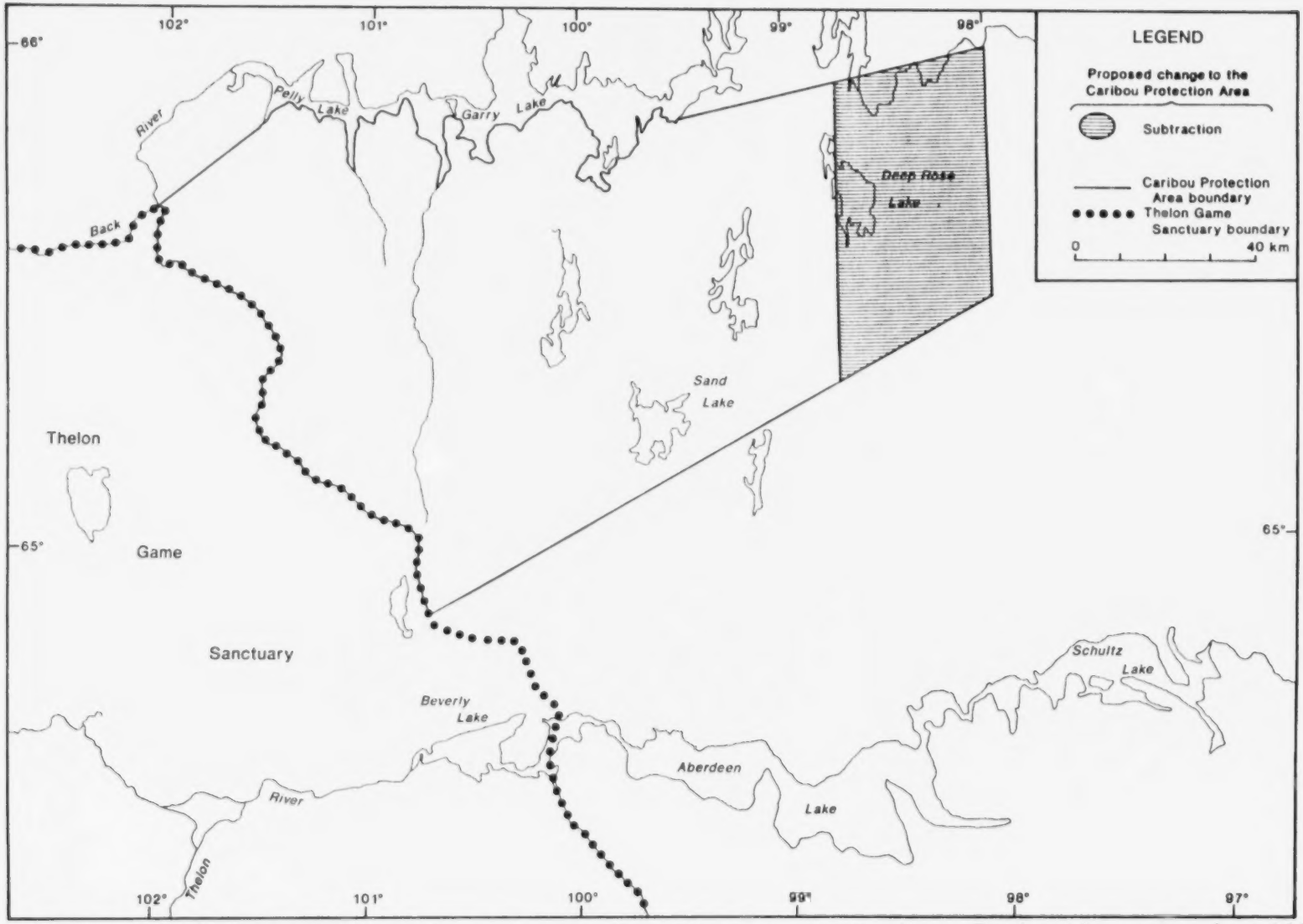


Figure 12. Recommended boundary changes for the Beverly Caribou Protection Area in 1990.

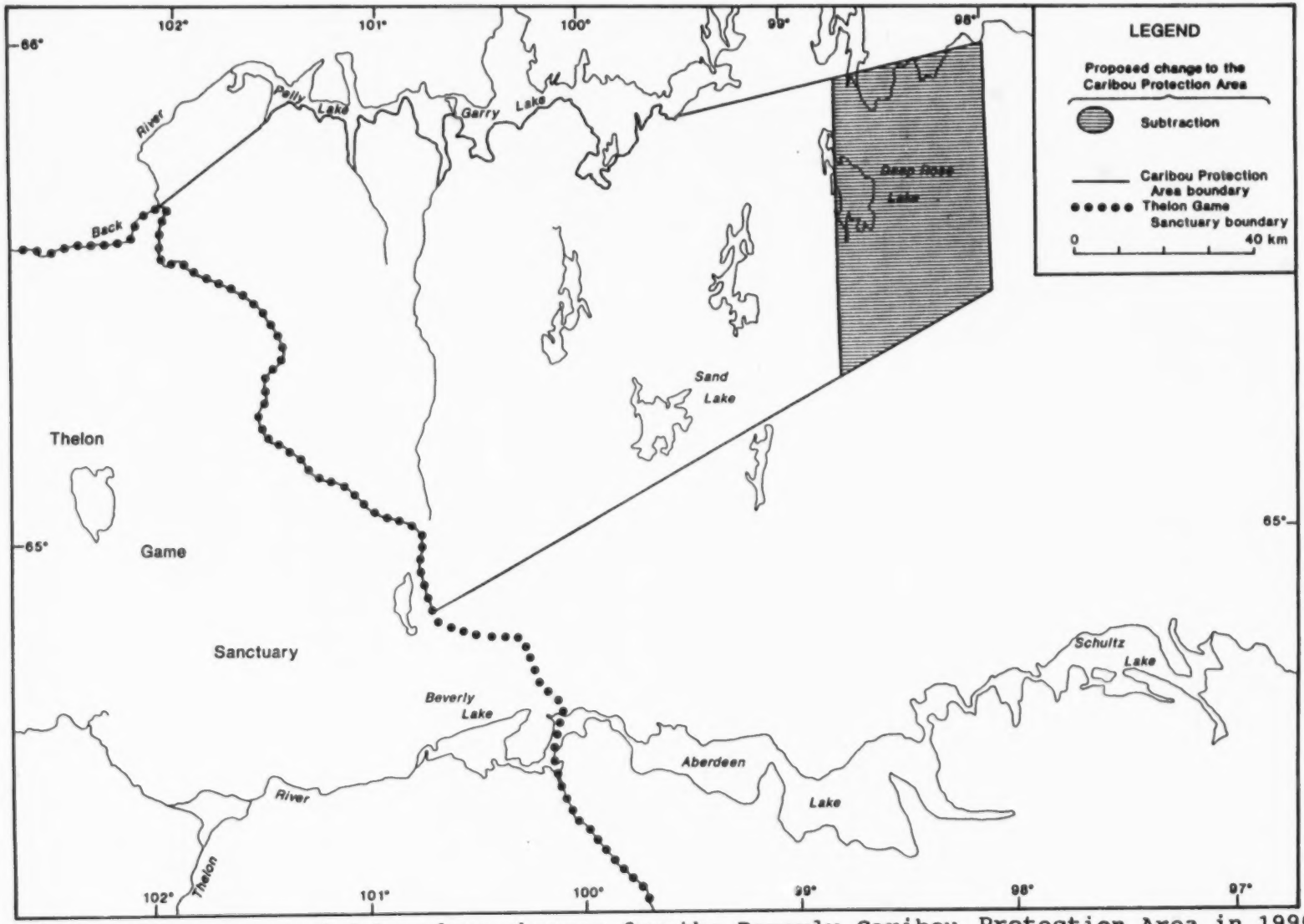


Figure 12. Recommended boundary changes for the Beverly Caribou Protection Area in 1990.

1989), we recommend that this area again be considered for inclusion within the Kaminuriak Protection Area. In the northern portion of the Kaminuriak Protection Area 2 sections have been unused by cows and calves during the past 5 years and can be deleted. Recommendations:

2. A 430 $km^2$ area extending eastwards to longitude 92°45'W in the coastal area between Pistol Bay and Mistake Bay (Fig. 13) should be included in the Kaminuriak Protection Area, as recommended in 1989. This would represent a 1% increase in overall size of the existing Protection Area.

3. A 440 $km^2$ area to the northwest (Fig. 13), located to the west of a line connecting 63°35'N X 96°32'W and 63°00'N X 96°33'W, should be deleted from the Kaminuriak Protection Area, as recommended in 1989. This would represent a 1% decrease in overall size of the existing Protection Area.

4. A 880 $km^2$ area to the northeast (Fig. 13), located to the northeast of a line connecting 63°44'N X 95°03'W and 63°14'N X 94°00'W, should be deleted from the Kaminuriak Protection Area. This would represent a 3% decrease in overall size of the existing Protection Area.

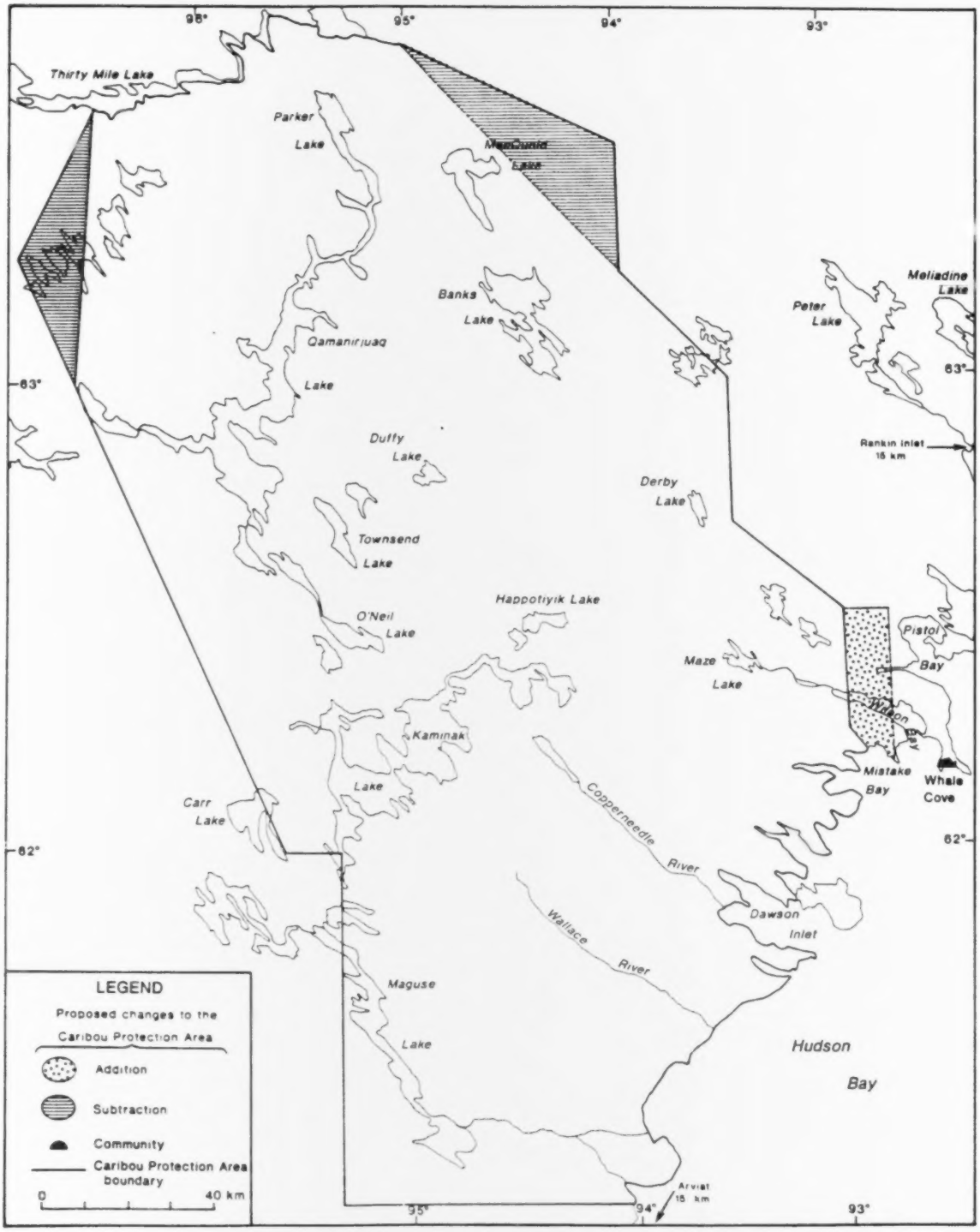


Figure 13. Recommended boundary changes for the Kaminuriak Caribou Protection Area in 1990.

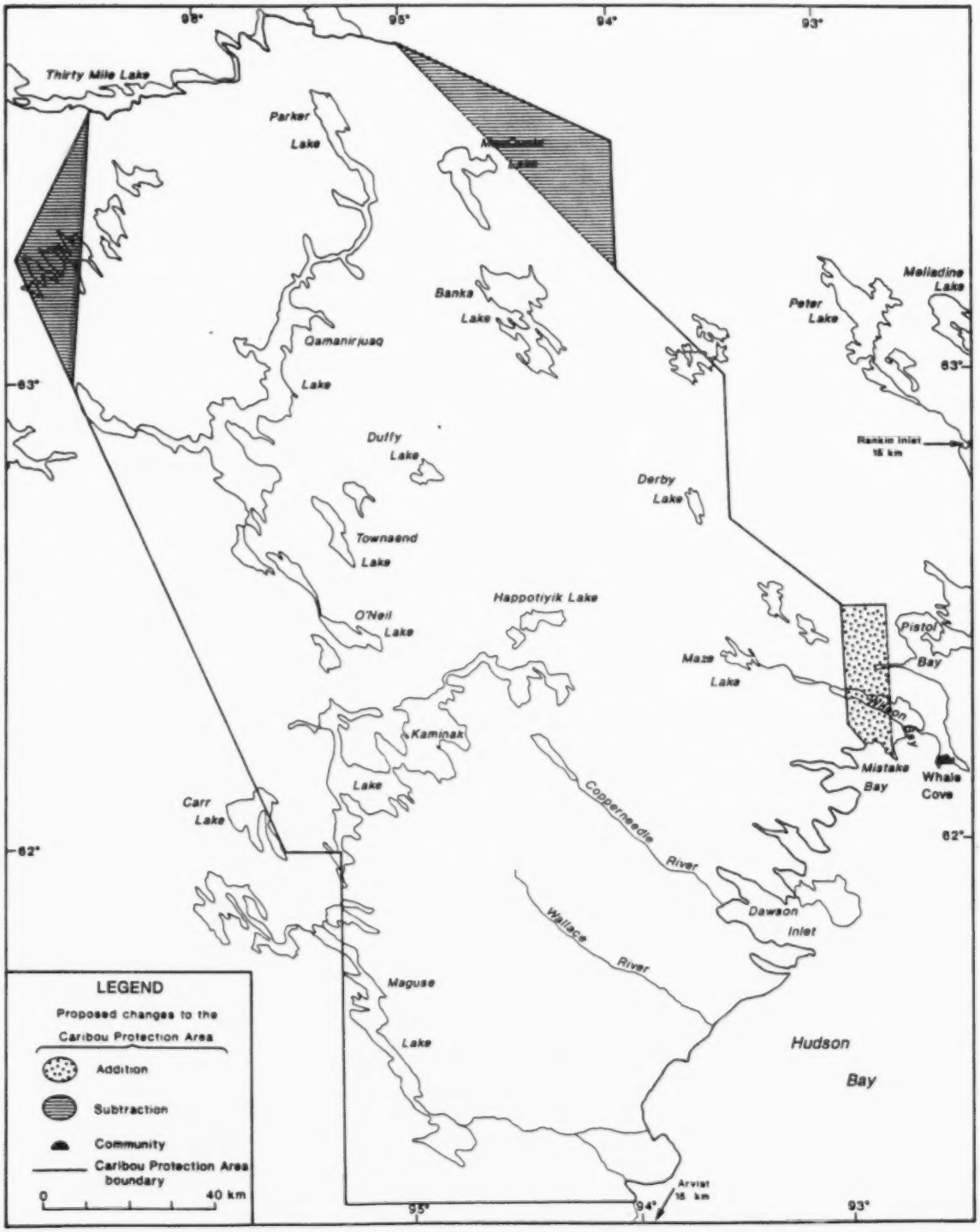


Figure 13. Recommended boundary changes for the Kaminuriak Caribou Protection Area in 1990.

## Air Charter

Aircraft problems encountered by Keewatin Air earlier on in the monitoring period resulted in an alternative aircraft being made available. The Beech Baron aircraft offered a more economical hourly rate and, therefore, an increased number of hours of flying. This twin engine aircraft provided good visibility (better than the Merlin aircraft) and a comparative cruising speed. The Caribou Monitor was offered first priority with the Beech Baron aircraft, unlike the Merlin aircraft which was called away on several occasions for medivac flights.

Neither of these planes were equipped with an electronic location system as hoped for. All flights necessitated visual navigation, which was more difficult during May when snow cover exceeded 50%. As a result, on one occasion (mid-June) a major deviation from the planned flight line did occur. The success of visual navigation is directly related to the pilot's experience, and collaboration between pilot and Monitor.

Based on the 1990 caribou monitoring season it is recommended that:

1. Smaller, less expensive, aircraft such as the Beech Baron, should be considered for this monitoring project in order to provide more flying time.

2. The choice of aircraft should take into account the availability of an electronic location system such as "Omega" or "Global Positioning System (GPS)". The use of electronic navigational aids is known to reduce costs and increase the efficiency and accuracy of aerial surveys (Boer et al. 1989).

## ACKNOWLEDGEMENTS

First, thanks are addressed to Keewatin Air pilots, especially Tom Kissock, for his professionalism, staying alert during long monitoring hours covering the land and maps. Friendly ambience with Keewatin Air staff made the work enjoyable.

I.N.A.C., who funded this project, provided space and office facilities in Rankin Inlet. Sincere thanks are addressed to Cecilia Autut, Henry Kablalik, and Scott Mitchell for their helpfulness in a cheerful atmosphere.

Jack Kabvitok and all other observers who accompanied us on flights provided significant help, by reporting additional sightings. All information provided by Renewable Resource Officers of the Keewatin Region, as well as by local people, was indispensable for this work. Special thanks to Gerry Leprieur and David Oolooyuk who shared numerous discussions over coffee at their Rankin Inlet office.

Lastly, we would like to thank Doug Heard, Jim Umpherson and Scott Mitchell for reviewing the draft of this report.

## PERSONAL COMMUNICATIONS

Bradley, M., Wildlife Technician, Department of Renewable Resources, G.N.W.T., Arviat, NWT.

Bourget, R., Renewable Resource Officer, Department of Renewable Resources, G.N.W.T., Baker Lake, NWT.

Heard, D., Caribou Biologist, Department of Renewable Resources, G.N.W.T., Yellowknife, NWT.

Kablalik, H., Assistant Resource Management Officer, Indian and Northern Affairs Canada, Rankin Inlet, NWT.

Kerney, S., Regional Wildlife Officer, Wildlife Branch, Department of Natural Resources, Thompson, Manitoba.

Kovic, B., Renewable Resource Officer, Department of Renewable Resources, G.N.W.T., Arviat, NWT.

Leprieur, G., Renewable Resource Officer, Department of Renewable Resources, G.N.W.T., Rankin Inlet, NWT.

Loewen, B., Municipal Engineer, Municipal and Community Affairs, Rankin Inlet, NWT.

Mitchell, S., District Manager, Indian and Northern Affairs Canada, Rankin Inlet, NWT.

Oolooyuk, D., Renewable Resource Officer, Department of Renewable Resources, G.N.W.T., Rankin Inlet, NWT.

Savikataaq, J., Renewable Resource Officer, Department of Renewable Resources, G.N.W.T., Arviat, NWT.

Williams, M., Caribou Technician, Department of Renewable Resources, G.N.W.T., Yellowknife, NWT.

# LITERATURE CITED

Boer, A.H., G. Redmond and T.J. Pettigrew. 1989. Loran-C: a navigation aid for aerial surveys. J. Wildl. Manage. 53(1): 228-230.

Bradley, M. 1985. Beverly and Kaminuriak caribou monitoring and land use controls, 1984. NWT Department of Renewable Resources File Rep. No. 57. 32 pp.

Bradley, M. and C.C. Gates. 1984. Beverly and Kaminuriak caribou monitoring and land use controls, 1983. NWT Department of Renewable Resources Prog. Rep. No. 9. 29 pp.

Chalmers, L. 1989. Beverly and Kaminuriak caribou monitoring and land use controls, 1989. NWT Department of Renewable Resources File Rep. No. 91. 44 pp.

Clement, H. 1982. Beverly and Kaminuriak caribou monitoring and land use controls, 1981. NWT Wildl. Serv. Prog. Rep. No. 6. 49 pp.

Clement, H. 1983. Beverly and Kaminuriak caribou monitoring and land use controls, 1982. NWT Wildl. Serv. Prog. Rep. No. 8. 41 pp.

Cooper, S. 1981. Beverly and Kaminuriak caribou monitoring and land use controls, 1980. NWT Wildl. Serv. Prog. Rep. No. 4. 74 pp.

Darby, W. 1978. Beverly and Kaminuriak caribou monitoring and land use controls, 1978. NWT Wildl. Serv. Compl. Rep. No. 1. 84 pp.

Darby, W. 1980. Beverly and Kaminuriak caribou monitoring and land use controls, 1979. NWT Wildl. Serv. Prog. Rep. No. 3. 51 pp.

Darby, W. and M. Williams. 1979. Procedures for monitoring movements of the Beverly and Kaminuriak caribou herds in relation to land use controls. NWT Wildl. Serv. Unpubl. Rep. 30 pp.

Duquette, L. 1985. Beverly and Kaminuriak caribou monitoring and land use controls, 1985. NWT Department of Renewable Resources File Rep. No. 59. 38 pp.

Kelsall, J.P. 1968. The migratory barren-ground caribou of Canada. Can. Wildl. Serv. Monograph No. 3. 340 pp.

Liepins, I. 1986. Beverly and Kaminuriak caribou monitoring and land use controls, 1986. NWT Department of Renewable Resources File Rep. No. 69. 34 pp.

Mychasiw, L. 1984. Five-year review of the Beverly and Kaminuriak caribou protection measures. NWT Wildl. Serv. File Rep. No. 42. 133 pp.

Ogilvie, C. 1987. Beverly and Kaminuriak caribou monitoring and land use controls, 1987. NWT Department of Renewable Resources File Rep. No. 72. 39 pp.

Ogilvie, C. 1989. Beverly and Kaminuriak caribou monitoring and land use controls, 1988. NWT Department of Renewable Resources File Rep. No. 75. 36 pp.

APPENDIX A. 1990 Caribou Protection Measures

1. Caribou Protection Areas

(a) The Permittee shall not, without approval, conduct any activity between May 15 and July 15 within the Caribou Protection Areas depicted on the map certified by the Engineer as the "Caribou Protection Map" annexed to this Land Use Permit.

(b) A Permittee may, upon approval by the Land Use Inspector, operate within the said Caribou Protection Areas, beyond the May 15 deadline set out in 1(a), provided that when monitoring information indicates that caribou cows are approaching the area of operation, the Permittee will implement 1(c).

(c) On cessation of activities pursuant to 1(a) or 1(b), the Permittee will remove all personnel from the zone who are not required for the maintenance and protection of the camp facilities and equipment unless otherwise directed by the Land Use Inspector.

(d) The Permittee may commence or resume activities prior to July 15 within those parts of the Caribou Protection Areas released by the Land Use Inspector for the reason that caribou cows are not expected to use those parts for calving or post-calving (note 1).

2. Caribou Protection General

(a) In the event that caribou cows calve outside of the Caribou Protection Areas, the Permittee shall suspend operations within the area(s) occupied by cows and/or calves between May 15 and July 15.

(b) In the event that caribou cows and calves are present the Permittee shall suspend:

(i) blasting,

(ii) overflights by aircraft at any latitude or less than 300 metres above the ground level, and,

(iii) the use of snowmobiles and ATV's (all-terrain vehicles) outside the immediate vicinity of the camp.

Appendix A. (continued)

3. Caribou Protection Migration

   (a) During migration of Caribou, the Permittee shall not locate any operation so as to block or cause substantial diversion to migration.

   (b) The Permittee shall cease activities that may interfere with migration, such as airborne geophysics surveys or movement of equipment, until the migrating caribou have passed.

4. Caribou Crossing

   (a) The Permittee shall not, between May 15 and September 1, construct any camp, cache any fuel or conduct any blasting within 10 km of any "Designated Crossing" as outlined on the map certified by the Engineer as the "Caribou Protection Map" and annexed to this Land Use Permit.

   (b) The Permittee shall not, between May 15 and September 1, conduct any diamond drilling operation within 5 km of any "Designated Crossing" as outlined on the map certified by the Engineer as the "Caribou Protection Map" and annexed to this Land Use Permit.

NOTE

1. The Land Use Inspector's decision will be based on the existing caribou information.

2. Concentrations of caribou should be avoided by low level aircraft at all times.

APPENDIX B. Standard 1990 Caribou Monitoring Flight Report.

**CARIBOU MONITORING FLIGHT REPORT**

**Date :**
**Flight number :**
**File name :**
**Observers :**
**Aircraft :**
**Pilot - Copilot :**
**Flight altitude :**
**Flight time :**

**Temperature :**
**Wind :**
**Visibility :**
**Cloud cover :**
**Snow cover :**
**Ice conditions :**

==========

Land use rationale

Observations

Notes: Numbers correspond to observation points on flight map(s)
Light tracks = less than 50 caribou
Moderate tracks = 50 to 100 caribou
Heavy tracks = more than 100 caribou

Land use activity

Other human activity

Water crossing

Summary

Signature_____ Date_____
Caribou Monitor

APPENDIX C. Other Mammal Species Observed on 1990 Monitoring Flights.

| Observation | Date | Location |
|---|---|---|
| 1 wolf | 23 May | east of Kaminak Lake; 62°08'N X 95°05'W |
| ca. 20 muskoxen | 10 June | south of Upper Garry Lake; 65°42'N X 100°27'W |
| 1 arctic fox | 10 June | ca. 10 km northwest of Rankin Inlet |
| 1 muskox | 28 June | near Urangesellschaft land use site, Kiggavik area; 65°15'N X 98°34'W |
| 2 muskoxen | 28 June | northwest section of Kaminuriak Caribou Protection Area; 65°42'N X 100°48'W |
| 2 muskoxen | 28 June | northwest section of Kaminuriak Caribou Protection Area; 65°35'N X 102°03'W |
| 1 wolf | 29 June | east of Maguse Lake; 61°44'N X 94°29'W |
| 5 muskoxen | 5 July | south of Thirty Mile Lake; 63°20'N X 96°35'W |
| 1 wolf | 13 July | east of Kaminak Lake; 62°01'N X 95°07'W |

APPENDIX C.(continued)

| Observation | Date | Location |
|---|---|---|
| 25 muskoxen[a] | 19 July | north of Yathkyed Lake; 63°06'N X 97°07'W |
| 25 muskoxen[a] | 20 July | south of Forde Lake; 63°15'N X 97°19'W |

a Brad Loewen pers. comm.